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Experience Study

For the Five-Year Period

Ending July 1, 2017

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TABLE OF CONTENTS

Section		Page
I	Summary of Results	1
II	Economic Assumptions	3
III	Demographic Assumptions	18
	Rates of Withdrawal	19
	Rates of Disability Retirement	23
	Rates of Retirement	25
	Rates of Post-Retirement Mortality	35
	Rates of Salary Increase	42
IV	Actuarial Methods	46
V	Summary and Cost of Changes	48

Appendix

A	Historical June CPI (U) Index	49
B	Capital Market Assumptions and Asset Allocation	50
C	Social Security Administration Wage Index	53
D	Recommended Decrement Tables	54

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May 3, 2018

Teachers' Retirement Board
State of Montana
1500 Sixth Avenue
Helena, MT 59620-0139

Dear Members of the Board:

We are pleased to submit the results of a study of the economic and demographic experience for the Montana Teachers' Retirement System. The purpose of this investigation is to assess the reasonability of the actuarial assumptions for the System. This investigation covers the five-year period from July 1, 2013 to July 1, 2017. As a result of the investigation, it is recommended that revised assumptions be adopted by the Board for future use.

The experience study includes all active members, retired members and beneficiaries of deceased members. The mortality experience was studied separately for males and females. Incidences of withdrawal, disability, retirement and compensation increases were investigated without regard to gender. Retirement experience and compensation increases were investigated separately for university and non-university members.

This report shows comparisons between the actual and expected cases of separation from active service, actual and expected number of deaths, and actual and expected salary increases. Tables and graphs are used to show the actual decrement rates, the expected decrement rates and, where applicable, the proposed decrement rates.

The recommended decrement tables are shown in Appendix D of this report. In the actuary's judgment, the recommended rates are suitable for use until further experience indicates that modifications are needed.

Actuarial assumptions are used to measure and budget future costs. Changing assumptions will not change the actual cost of future benefits. Once the assumptions have been adopted, the actuarial valuation measures the adequacy of the contributions rates set in Montana State Law.

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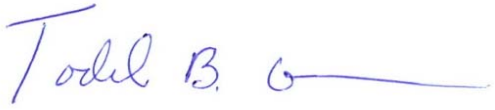
The experience study was performed by, and under the supervision of, independent actuaries who are members of the American Academy of Actuaries with experience in performing valuations for public retirement systems. The undersigned meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,



Edward A. Macdonald ASA, FCA, MAAA
President

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Summary of Results

The following summarizes the findings and recommendations with regard to the assumptions utilized by the Montana Teachers' Retirement System. Explanations for the recommendations are found in the sections that follow.

Recommended Economic Assumption Changes

The table below lists the three economic assumptions used in the actuarial valuation and their current and proposed rates. We recommend reducing the assumed rates of price inflation and real wage growth.

Item	Current	Proposed
Price Inflation	3.25%	2.50%
Investment Return	7.75%	7.50%
Real Wage Growth	0.75%	0.75%

Recommended Demographic Assumption Changes

The table below lists the demographic assumptions that we recommend be changed based on the experience of the last five years.

Assumption Change
Update pre and post retirement mortality rates
Update termination rates
Update retirement rates
Update rates of salary increase

Recommended Method Changes

Payroll Growth Assumption

In keeping with the real wage growth change, we recommend that the payroll growth assumption for amortization as a level percent of pay be reduced from 4.00% to 3.25%. In addition, we recommend 0.10% reductions per year additional reductions to the payroll growth assumption to an ultimate payroll growth rate of 2.25% to match recent experience since 2009.

Financial Impact

The following table highlights the impact of the recommended changes noted on the previous page on the unfunded accrued liability (UAL) and funded status for the System as of July 1, 2017.

($ Thousands)

	Before Change	After Change
UAL	$1,663,323	$1,836,891
Funded Status	70.49%	68.39%

Economic Assumptions

There are three economic assumptions used in performing the actuarial valuation for the Montana Teachers' Retirement System. The assumptions are:

- Price Inflation
- Investment Return
- Wage Inflation

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 27, *"Selection of Economic Assumptions for Measuring Pension Obligations"*, which provides guidance to actuaries in selecting economic assumptions for measuring obligations under defined benefit plans. As noted in ASOP No. 27, because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes based on a mixture of past experience and future expectations. These estimates therefore are best stated as a range utilizing the actuary's professional judgment. In setting the range and the single point within that range to use, the actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table shows our recommendations followed by explanations of each assumption.

Item	Current	Proposed
Price Inflation	3.25%	2.50%
Real Rate of Return	4.50	5.00
Investment Return	7.75%	7.50%
Price Inflation	3.25%	2.50%
Real Wage Growth	0.75	0.75
Wage Inflation	4.00%	3.25%

Price Inflation

Background: As seen in the table on the previous page, assumed price inflation is used as a component for both the investment return assumption and the wage inflation assumption. The latter two assumptions will be discussed in detail in the following sections.

It is important that the price inflation assumption be consistently applied throughout the economic assumptions utilized in an actuarial valuation. This is called for in ASOP No. 27.

The current price inflation assumption is 3.25% per year.

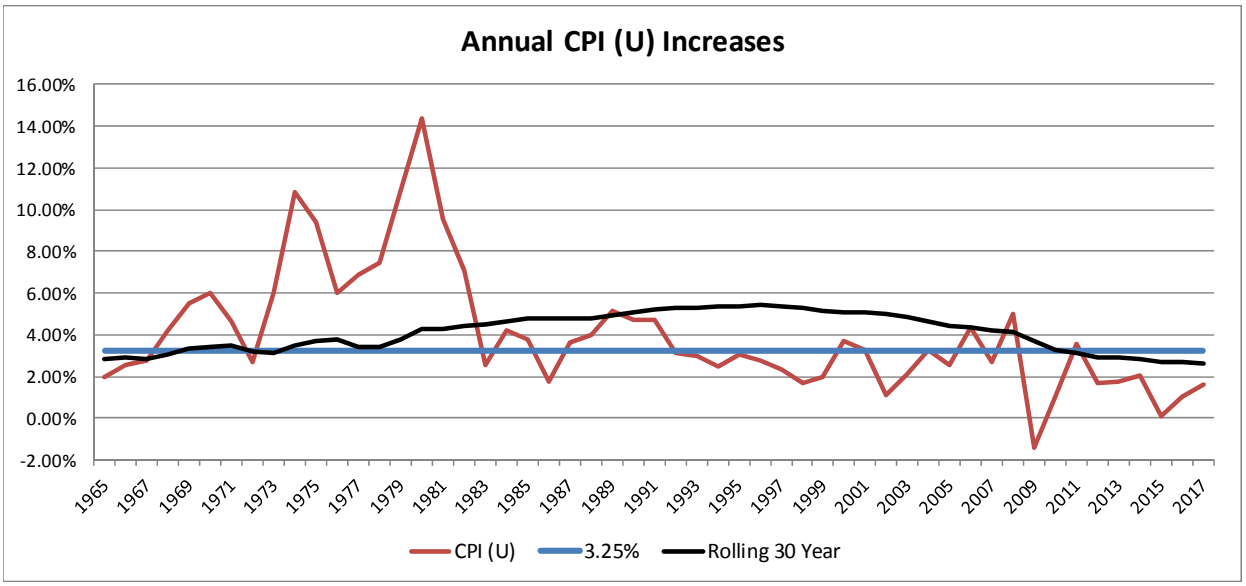
Past Experience: The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The level of that index in June of each of the last 50 years is provided in Appendix A.

In analyzing this data, average rates of inflation have been determined by measuring the compound growth rate of the CPI (U) over various time periods. The results are as follows:

Period	Average Annual Rate of Inflation
2007 – 2017	1.63%
1997 – 2017	2.14%
1987 – 2017	2.60%
1977 – 2017	3.55%
1967 – 2017	4.07%
1957 – 2017	3.67%
1926 – 2017	2.91%

Over shorter historic periods, the average annual rate of increase in the CPI-U has been below 3.00%. The years of high inflation occurring from 1973 to 1982 has a significant impact on the averages over periods which include these rates. We should add that since 1926, the average annual rate of inflation was 2.91%.

The graph below shows the annual increases in the CPI (U) over a 50 year period.



Additional information to consider is obtained from measuring the spread on inflation protected treasury bills (TIPS) and from the prevailing economic forecasts. The spread between the nominal yield on treasury securities and the inflation indexed nominal yield on TIPS of the same maturity is referred to as the "breakeven rate of inflation" and represents the bond market's expectation of inflation over the period to maturity. The table below provides the calculation of the breakeven rate of inflation as of June 30, 2017 over various periods.

Years to Maturity	Bond Nominal Yield	TIPS Nominal Yield	Breakeven Rate of Inflation
10	2.32%	0.55%	1.77%
20	2.65%	0.84%	1.82%
30	2.88%	1.01%	1.88%

The bond market's expectation for the rate of inflation is significantly lower than historical average annual rates. Additionally, based upon information provided from the "Survey of Professional Forecasters" published by the Philadelphia Federal Reserve Bank, the median annual rate of inflation for the ten years beginning July 1, 2017 is 2.30%.

Recommendation: It is difficult to accurately predict inflation. Current economic forecasts and the bond market suggest lower inflation over the next ten to twenty years when compared to the historical averages, which is a shorter time period than appropriate for our purposes. In the 2017 OASDI Trustees Report, the Chief Actuary for Social Security bases the 75 year cost projections on an intermediate inflation assumption of 2.6% with a range of 2.0% - 3.2%. We concur in general with a range of 2.0% - 3.0%, and recommend use of a 2.50% per year.

Price Inflation Assumption	
Current	3.25%
Recommended	2.50%

Investment Return

Background: The assumed investment return is one of the most significant assumptions in the annual actuarial valuation process as it is used to discount the expected benefit payments for all active, inactive and retired members of the System. Minor changes in this assumption can have a major impact on valuation results. The investment return assumption should reflect the asset allocation target for the funds set by the Board of Investments.

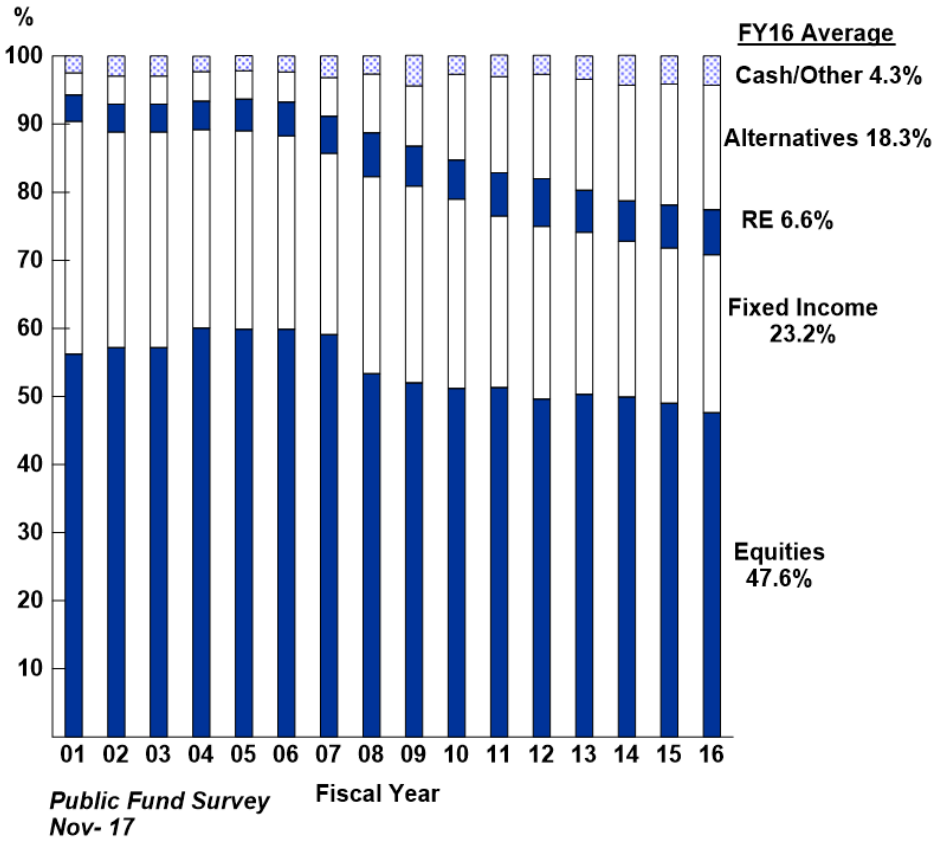
The current assumption is 7.75%, consisting of a price inflation assumption of 3.25% and a real rate of return assumption of 4.50%. The return is net of all investment and administrative expenses.

Recent Experience: The actuarial value of assets of the System are developed using a widely accepted asset-smoothing methodology that fully recognizes investment gains and losses over a four year period. The recent experience for the retirement funds over the last nineteen years is shown in the table below.

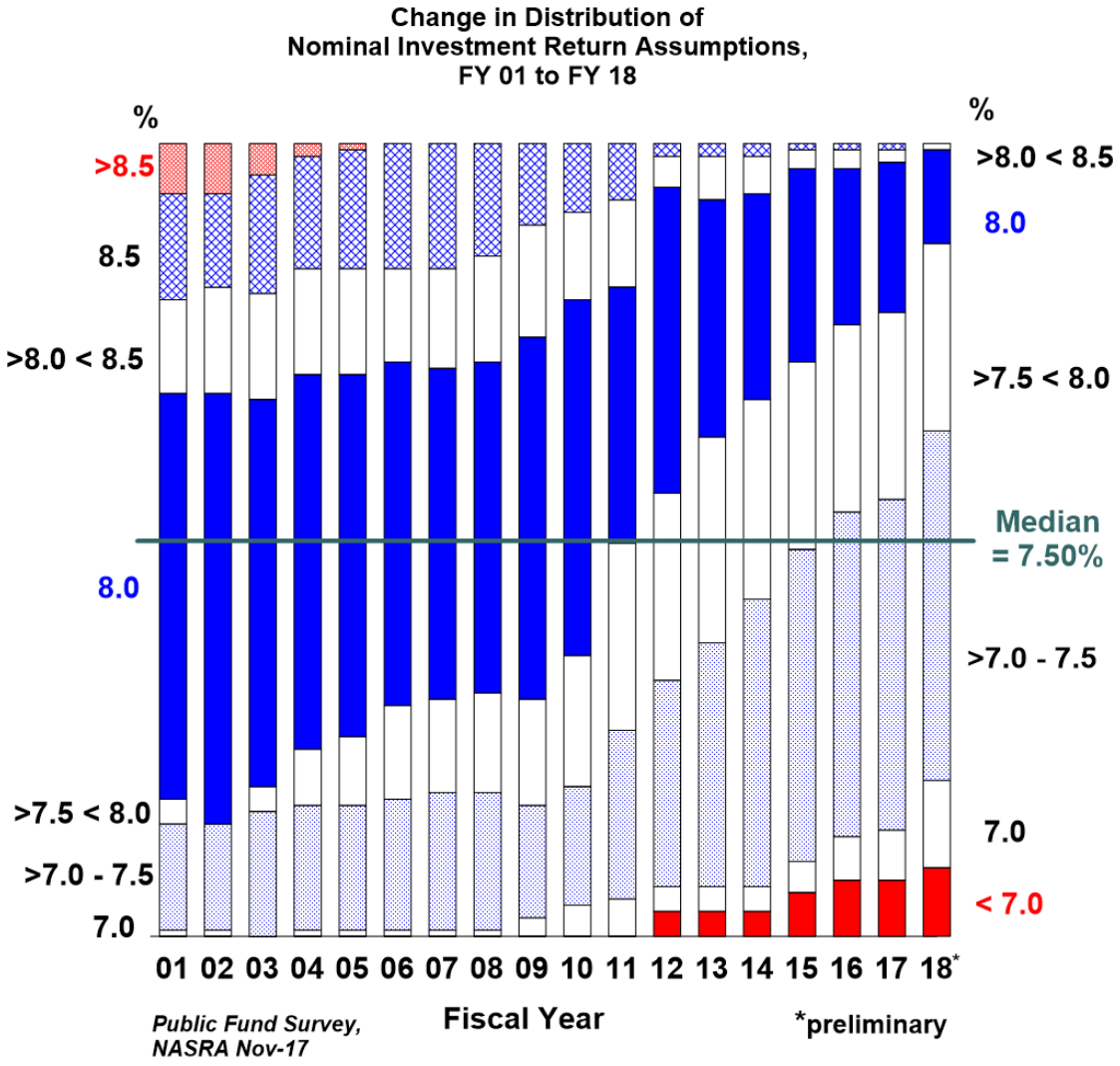
Nominal Total Rate of Return		
Year Ending 6/30	Market Value	Actuarial Value
1999	11.9%	12.3%
2000	7.8%	12.8%
2001	(5.1)%	9.2%
2002	(7.3)%	3.8%
2003	6.2%	1.6%
2004	13.3%	2.1%
2005	8.0%	2.7%
2006	8.9%	8.5%
2007	17.6%	10.2%
2008	(4.9)%	7.2%
2009	(20.8)%	(10.3)%
2010	12.9%	9.8%
2011	21.7%	(0.1)%
2012	2.2%	3.2%
2013	12.9%	12.0%
2014	17.1%	13.2%
2015	4.6%	9.6%
2016	2.1%	8.8%
2017	11.9%	8.2%
Average	**5.9%**	**6.4%**
15 Year Avg.	**7.1%**	**5.6%**
10 Year Avg.	**5.3%**	**5.9%**
5 Year Avg.	**9.6%**	**10.3%**

Peer System Comparison

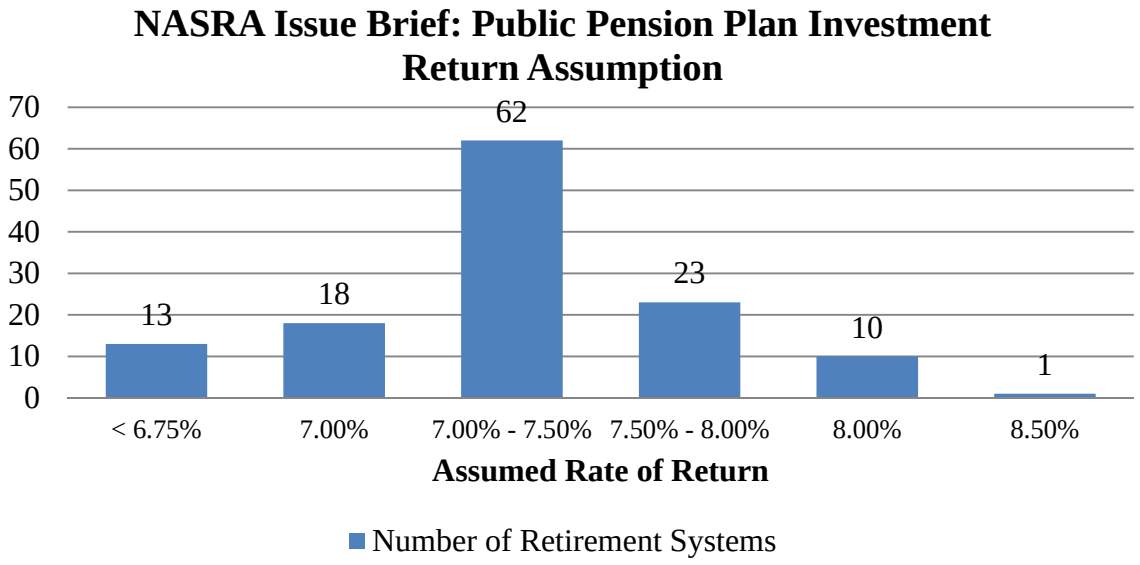
While we do not recommend that the selection of an investment return assumption be based on the assumptions used by other systems, it does provide another set of relevant information to consider. The following graph shows the change in the distribution of the investment return assumption from fiscal year 2001 through 2015 for the 120+ large public retirement systems included in the National Association of State Retirement Administrators (NASRA) Public Fund Survey. It is worth noting that the median investment return assumption is 7.50%. The assumed rate of return is heavily influenced by each Systems' asset allocation. The average asset allocation for the systems in the Public Fund Survey is 4.3% cash, 47.6% equities, 23.2% fixed income, 6.6% real estate, and 18.3% alternative investments which has an impact on the expected return of the systems. Note the increased allocation to alternative investment classes since 2006. The target asset allocation for TRS is 53% equities, 13% alternatives, 7% real estate, 25% fixed income and 2% cash, which is in line with the portfolio of an average system. As a result, it is reasonable to anticipate that the expected return for RVK could equal that of the median system. The chart below shows the asset allocation for 96 funds surveyed in the *Public Fund Survey* since 2001.



Below is a graph published by NASRA in the *Public Fund Survey* that shows the decreases in the investment return assumptions used by public plans over the last several years.



Review of the *NASRA Issue Brief: Public Pension Plan Investment Return Assumptions* update as of February 2018, 7.50% is the predominant assumption for public sector pension systems while the median is 7.50% and the average assumption is 7.32%.



Capital Market Assumption Analysis: The current capital market assumptions and target asset allocations are shown in Appendix B. Using statistical distribution properties based upon capital market assumptions utilized by the Montana Board of Investments, provided by RVKuhns in setting the System's asset allocation targets, provides an expected range of real rates of return over various time horizons.

Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	4.35%	12.95%	(15.51)%	(4.74)%	3.55%	12.56%	26.91%
5	3.71%	5.74%	(5.45)%	(0.24)%	3.55%	7.49%	13.41%
10	3.63%	4.05%	(2.90)%	0.86%	3.55%	6.32%	10.43%
20	3.59%	2.86%	**(1.05)%**	1.64%	3.55%	5.50%	8.37%
30	3.58%	2.34%	(0.22)%	1.99%	3.55%	5.14%	7.47%
50	3.57%	1.81%	0.61%	**2.34%**	3.55%	**4.78%**	6.57%

The percentile ranks are the outcomes based on the log normal random variable distribution that produce returns of less than the return at that particular percentile level over the time span. Thus for the 20 year time span, 5% of the resulting real rates of return were below -1.05% and 95% were above that. As the time span increases, the results begin to merge. Over a 50 year time span, the result indicate there is a 25% chance that real return will be above 4.78% and a 25% chance they will be below 2.34%. In other words there is a 50% chance the real returns will be between 2.34% and 4.78%.

It is important to note that capital market assumptions can be quite volatile from year to year and from investment consultant to investment consultant as they tend to forecast shorter time horizons than typically required by the public plan actuarial community when looking at the long-term time horizon of a public pension system. In the section that follows, we will demonstrate the long-term nature of the fund. As a result we will perform the same analysis that was performed above, however, instead of using the capital market assumptions provided by RVKuhns will use the 20-Year Horizon capital market assumptions published in the *Survey of Capital Market Assumptions: 2017 Edition* published by Horizon Actuarial Services, LLC.

Below are the expected range of real rates of return over various time horizons.

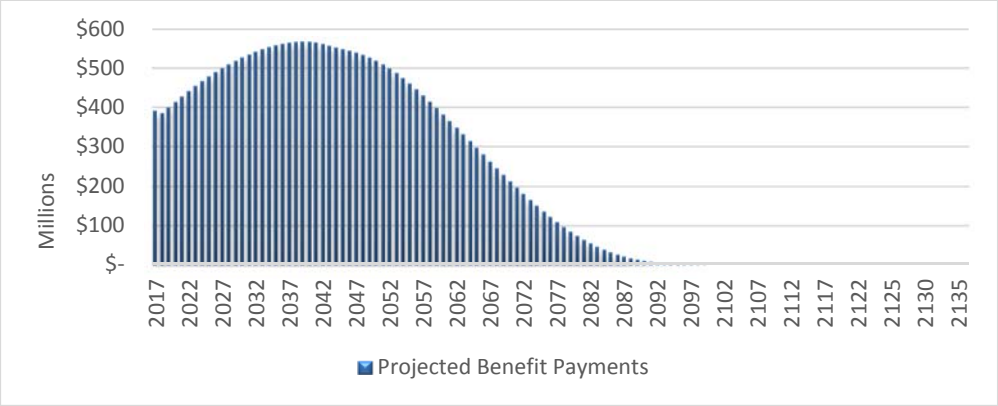
Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	5.72%	11.74%	(12.42)%	(2.49)%	5.07%	13.22%	26.06%
5	5.20%	5.21%	(3.15)%	1.62%	5.07%	8.64%	13.99%
10	5.14%	3.68%	(0.81)%	2.62%	5.07%	7.58%	11.30%
20	5.10%	2.60%	**0.88%**	3.33%	5.07%	6.84%	9.44%
30	5.09%	2.12%	1.64%	3.65%	5.07%	6.51%	8.62%
50	5.08%	1.65%	2.40%	**3.97%**	5.07%	**6.19%**	7.81%

Over a 50 year time span, the result indicate the median long-term real rate of return is 5.07%.

Long Term Perspective

Because the economy is constantly changing, assumptions about what may occur in the near term are volatile. Asset managers and investment consultants usually focus on this near-term horizon in order to make prudent choices regarding how to invest the trust funds (asset allocation). For actuarial calculations, we typically consider very long periods of time as some current employees will still be receiving benefit payments more than 60 years from now. For example, a newly-hired member who is 25 years old may work for 30 years, to age 55, and live another 30 years, to age 85. The retirement system would receive contributions for the first 30 years and then pay out benefits for the next 30 years. During the entire 60-year period, TRS is investing assets on behalf of the member. In addition, in an open ongoing system like TRS, the stream of benefit payments is continually increasing as new hires replace current members who leave covered employment due to death, termination of employment, and retirement. This difference in the time horizon used by actuaries and investment consultants is frequently a source of debate and confusion when setting economic assumptions.

The following graph illustrates the long duration of the expected benefit payments for current members on July 1, 2017.



Investment Expenses

Administrative expenses are directly reflected as a separate component in the calculation of the contribution rate. However, the investment return is assumed to be net of all investment-related expenses. The following table shows the ratio of expenses to Plan assets over the last eight years. The expense ratio is calculated as the total expense divided by the ending asset balance at fair market value. The table below compares, for the last nine years, the expense levels during the fiscal year to the market value of assets for the systems at the end of the fiscal years.

FY Ending June 30	Investment Expenses	Market Value of Assets	Expense Ratio
2009	$ 15,459,976	$ 2,301,828,565	0.67%
2010	15,700,878	2,521,445,720	0.62
2011	16,313,266	2,972,419,220	0.55
2012	16,154,418	2,932,202,476	0.55
2013	15,148,782	3,185,064,406	0.48
2014	20,130,499	3,652,100,237	0.55
2015	20,479,079	3,708,385,838	0.55
2016	22,349,286	3,656,830,798	0.61
2017	20,425,220	3,950,704,563	0.52

Over the five-year period ended June 30, 2017 the expense ratio averaged approximately 0.54%. For the nine-year period ended June 30, 2017 the expense ratio averaged approximately 0.57%.

The capital market assumptions are net of investment expenses; therefore a separate investment expense assumption is not necessary.

Recommendation: Using the building block approach of ASOP No. 27 and the projection results outlined above, we recommend a range for the investment return assumption of the 25th to 75th percentile real returns over the 50 year time span plus the recommended inflation assumption less the recommended expense ratio assumption. The following table details the range. It should be noted that the time horizon that the reasonable range is relatively short compared to the time horizon required by actuaries. The difference in these time horizons can account for increased return in the long term.

Item	25th Percentile	50th Percentile	75th Percentile
Real Rate of Return	3.97%	5.07%	6.19%
Inflation	2.50	2.50	2.50
Expenses*	0.00	0.00	0.00
Net Investment Return	6.47%	7.57%	8.69%

* *The capital market assumptions used to develop the reasonable range for the real rate of return are net of investment expenses. Therefore a separate assumption for investment expenses is not necessary.*

The current assumed rate of return of 7.75% is higher than the average assumed rate of return compared with its peer group of other public retirement systems. The 50th percentile net return based on the analysis utilizing the capital market assumptions provided by RVKuhns is 6.05% compared to 7.57% utilizing the capital market assumptions provided in the Horizon Survey.

The capital market assumptions developed by the investment consultant are often intended for use over a 10-year investment horizon and are not always useful in setting the long-term rate of return for funding pension plans which covers a longer timeframe. The long-term rate of return assumption is intended to be a long-term assumption (30 to 50 years) and is not expected to change absent a significant change in the asset allocation, a change in the inflation assumption, or a fundamental change in the market that alters expected returns in future years. The capital market assumptions provided by the investment consultant yielded a median real rate of return of 3.55%. The average long term capital market assumptions published in the Survey of Capital Market Assumptions 2017 Edition by Horizon Actuarial Service, LLC, yield a median real return of 5.07%. We recommended the long-term real rate of return assumption of 5.00% which reflects granting each source some degree of credibility.

Our recommendation taking into account historical analysis, peer group analysis and the capital market assumption analysis is to reduce the current assumed rate of return from 7.75% to 7.50%.

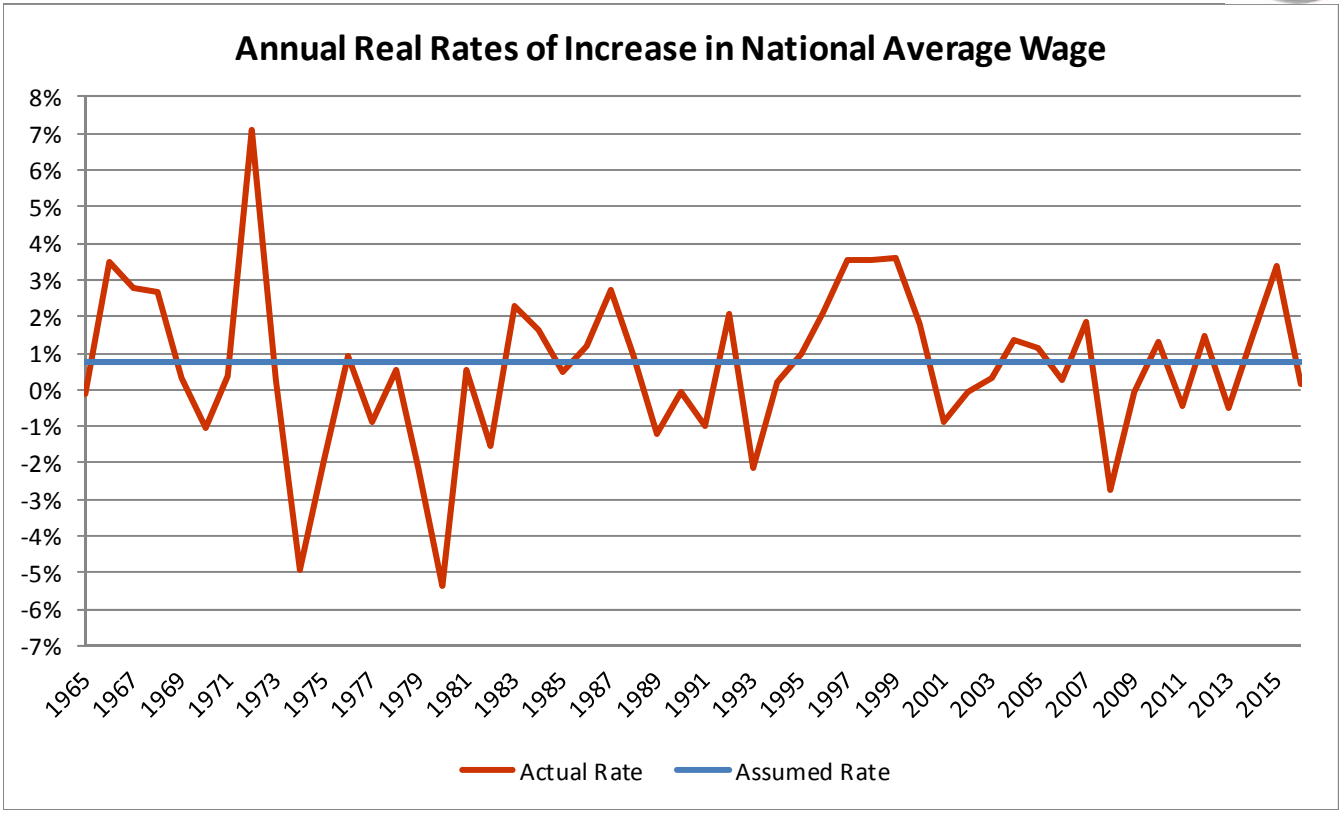
Wage Inflation

Background: The assumed future increases in salaries consist of an inflation component and a component for promotion and longevity, often called merit increases. Merit increases are generally age and or service related, and will be studied in the demographic assumption section of the report. Wage inflation normally is above price inflation, which reflects the overall return on labor in the economy. The current wage inflation assumption is 4.00%, or 0.75% above price inflation.

Past Experience: The Social Security Administration publishes data on wage growth in the United States. Appendix C shows the last 50 calendar years' data. As we did in our analysis of inflation, on the following page, we show the wage inflation and a comparison with the price inflation over various time periods. Since wage data is only available through 2008 we use that year as the end point.

Period	Wage Inflation	Price Inflation	Real Wage Growth
2006-2016	2.33%	1.74%	0.58%
1996-2016	3.20	2.18	1.00
1986-2016	3.50	2.66	0.82
1976-2016	4.24	3.68	0.54
1966-2016	4.68	4.10	0.56

Thus, over the last 50 years, annual real wage growth has averaged 0.56%. The graph on the following page shows the annual increases in real wage growth over the entire 50-year period.



Recommendation: As we did with price inflation, we again look at the 2017 OASDI Trustees Report. The Chief Actuary for Social Security bases the 75 year cost projections on a national wage growth assumption 1.2% greater than the price inflation assumption of 2.6%. We concur in general with a range of .6% - 1.8%, and recommend maintaining 0.75% per year rate at the current time.

Wage Inflation Assumption		
Current	4.00%	
	Reasonable Range	
Real Wage Growth	0.50%	1.50%
Inflation	2.50	2.50
Total	3.00%	4.00%
Recommended	3.25%	

Demographic Assumptions

There are several demographic assumptions used in the actuarial valuations performed for the Montana Teachers' Retirement System. They are:

- Rates of Withdrawal
- Rates of Disability Retirement
- Rates of Service Retirement
- Rates of Post-retirement Mortality
- Rates of Post-retirement Disabled Mortality
- Rates of Salary Increase for Merit and Promotions

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 35, *"Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations"*, which provides guidance to actuaries in selecting demographic assumptions for measuring obligations under defined benefit plans. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP No. 35.

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period (July 1, 2013 through July 1, 2017) with what was expected to happen based on the assumptions used in the most recent actuarial valuations.

Detailed tabulations by age, service and/or gender are performed over the entire study period. These tabulations look at all active and retired members during the period as well as separately identifying those who experience a demographic event, also referred to as a decrement. In addition, the tabulation of all members together with the current assumptions permits the calculation of the number of expected decrements during the study period.

If the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, gender, or service does not follow the expected pattern, new assumptions are recommended. Recommended changes usually do not follow the exact actual experience during the observation period. Judgment is required to extrapolate future experience from past trends and current member behavior. In addition non-recurring events, such as early retirement windows, need to be taken into account in determining the weight to give to recent experience.

The remainder of this section presents the results of the demographic study. We have prepared tables that show a comparison of the actual and expected decrements and the overall ratio of actual to expected results under the current assumptions. If a change is being proposed, the revised actual to expected ratios are shown as well.

Rates of Withdrawal

It is not anticipated that all members will become eligible for a retirement benefit. Some members will terminate due to resignation or dismissal prior to becoming eligible for a retirement benefit. The rates of withdrawal adopted by the Board are used to determine the expected number of separations from active service that will occur prior to attaining the eligibility requirement for a retirement benefit as a result of resignation or dismissal. The investigation of withdrawal rates only includes members who have not become eligible for a retirement benefit during the experience period.

The current assumption utilizes a service based approach that sets the withdrawal rates based on years of service without regard for part time and full time employment. We recommend introducing separate withdrawal rates for part time and full time members. As a result, withdrawal experience was investigated separately for full time members and part time members without regard to gender for both Non-University and University members combined. The System is closed to new University members. As of the most recent actuarial valuation, University members represented less than 2% of the total population with an average service of 23 years. As a result, we do not think investigating withdrawal experience separately for Non-University and University members is warranted.

The analysis of the actual withdrawal experience for full time members over the five-year period indicates an overall actual/expected ratio of 79% and 157% respectively for full time members and part time members. A ratio that is greater than 100% indicates that there were more withdrawals during the experience period than were anticipated by the assumption. A ratio of less than 100% indicates that there were less withdrawals during the experience period than were anticipated by the assumption.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Years of Service	Full Time Withdrawal Experience			Part Time Withdrawal Experience		
	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
Less than 1	83	112.78	0.74	682	690.58	0.99
1	584	778.19	0.75	1,692	1,150.25	1.47
2	409	518.44	0.79	729	439.89	1.66
3	326	326.87	1.00	435	221.88	1.96
4	224	235.27	0.95	305	142.12	2.15
5	150	157.78	0.95	142	55.02	2.58
6	122	140.81	0.87	113	41.29	2.74
7	91	121.45	0.75	94	30.79	3.05
8	69	106.05	0.65	55	23.64	2.33
9	73	89.30	0.82	45	19.30	2.33
10	52	67.55	0.77	51	13.08	3.90
11	36	57.17	0.63	29	10.21	2.84
12	24	47.22	0.51	31	8.25	3.76
13	32	41.18	0.78	16	6.28	2.55
14	14	34.82	0.40	20	4.78	4.18
15	18	30.37	0.59	11	3.51	3.13
16	10	25.23	0.40	14	2.79	5.02
17	10	20.02	0.50	6	1.80	3.33
18	12	17.62	0.68	9	1.68	5.36
19	8	15.23	0.53	5	1.10	4.55
20	7	13.26	0.53	9	0.95	9.47
21	4	11.14	0.36	4	0.47	8.51
22	4	9.39	0.43	4	0.49	8.16
23	4	7.90	0.51	5	0.41	12.20
24	2	5.46	0.37	4	0.32	12.50
TOTAL	2,368	2,990.50	0.79	4,510	2,870.88	1.57

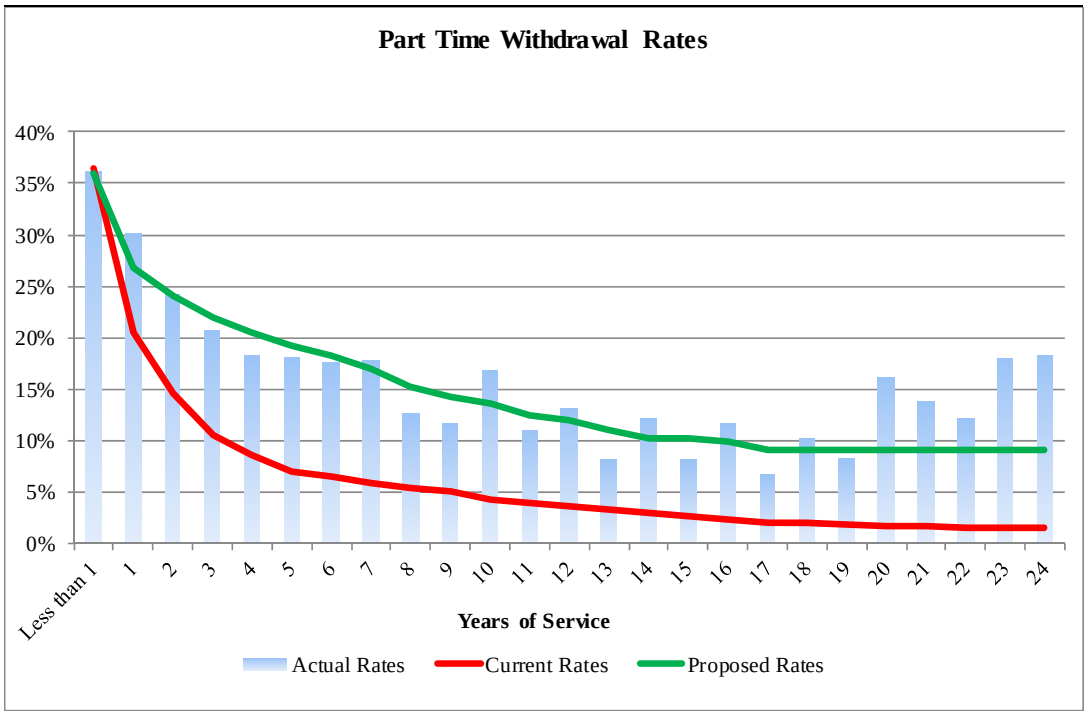
Findings and Recommendations

The current assumption significantly overestimates the number of withdrawals for full time members and underestimates the number of withdrawals for part time members. As a result, we recommend revising the rates of withdrawal for both full time and part time members. The actual/expected ratio under the proposed assumption for full time members and part time members is 94% and 103% respectively. A detailed listing of the recommended assumption is in Appendix D.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Years of Service	Full Time Withdrawal Experience			Part Time Withdrawal Experience		
	Actual	Proposed	Ratio Actual/Proposed	Actual	Proposed	Ratio Actual/Proposed
Less than 1	83	97.89	0.85	682	681.12	1.00
1	584	660.12	0.88	1,692	1,499.82	1.13
2	409	405.17	1.01	729	722.22	1.01
3	326	326.87	1.00	435	465.07	0.94
4	224	221.44	1.01	305	342.76	0.89
5	150	151.02	0.99	142	151.38	0.94
6	122	121.00	1.01	113	117.45	0.96
7	91	86.27	1.05	94	89.74	1.05
8	69	71.69	0.96	55	66.27	0.83
9	73	58.40	1.25	45	54.88	0.82
10	52	46.50	1.12	51	41.04	1.24
11	36	39.73	0.91	29	32.75	0.89
12	24	33.59	0.71	31	28.32	1.09
13	32	29.73	1.08	16	21.56	0.74
14	14	25.82	0.54	20	16.73	1.20
15	18	23.48	0.77	11	13.68	0.80
16	10	20.73	0.48	14	11.93	1.17
17	10	17.82	0.56	6	8.21	0.73
18	12	15.57	0.77	9	8.01	1.12
19	8	13.45	0.59	5	5.49	0.91
20	7	11.78	0.59	9	5.04	1.79
21	4	10.02	0.40	4	2.61	1.53
22	4	8.65	0.46	4	2.97	1.35
23	4	6.97	0.57	5	2.52	1.98
24	2	4.60	0.43	4	1.98	2.02
TOTAL	2,368	2,508.31	0.94	4,510	4,393.55	1.03

The chart below shows (i) the actual average withdrawal rates of employment by years of service during the past five years (ii) the current assumed withdrawal rates and (iii) the proposed assumed withdrawal rates.



Rates of Disability Retirement

The System provides disability benefits for those members who have completed five years of service. A disable member is entitled to an annuity that is equal to 1/60th of final compensation for each year of service accrued at the date of disability. The minimum disability benefit is equal to 1/4th of final compensation. A Tier Two member is not eligible for a disability retirement if the member is or will be eligible for a service retirement benefit on or before the member's date of determination. The rates of disability used in the actuarial valuation project the percentage of employees who are expected to become disabled each year.

Disability experience was investigated without regard to gender for both Non-University and University members combined.

The analysis of the actual disability experience for both Non-University and University members over the five-year experience period yields an actual/expected ratio of 78%. A ratio that is less than 100% indicates that there were less disability retirements during the experience period than were anticipated by the assumption.

The table below details the actual/expected ratio by age group and in total.

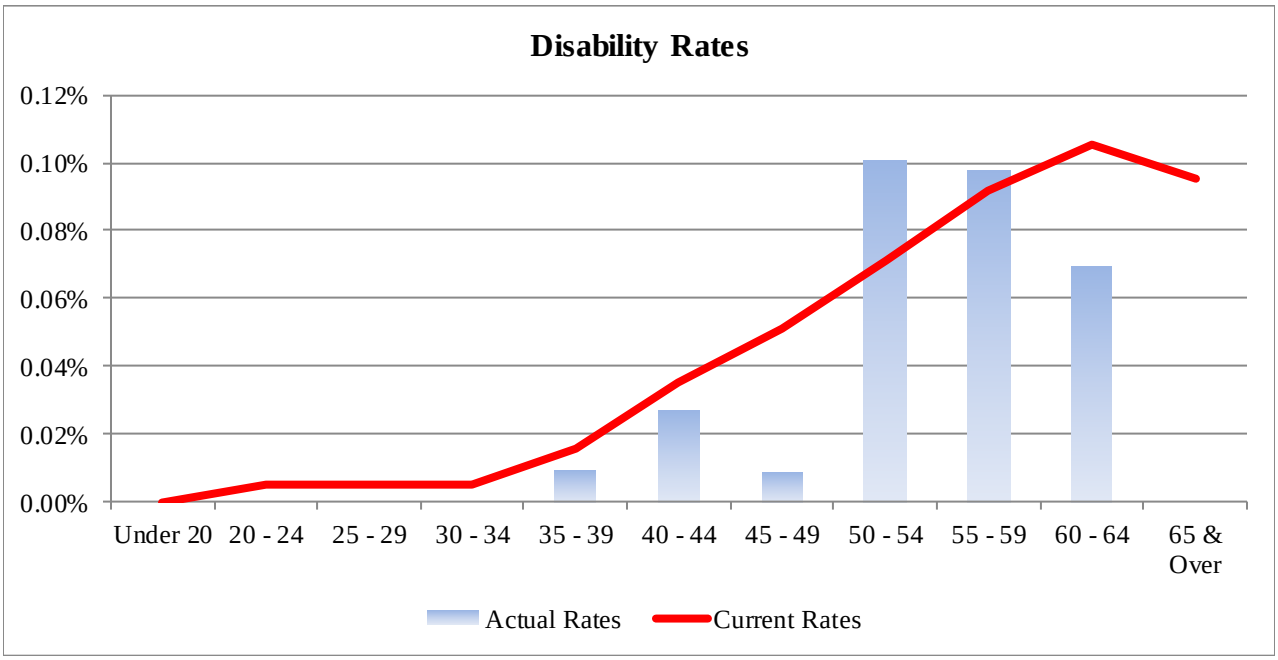
EXPERIENCE UNDER CURRENT ASSUMPTIONS

	Disability Experience		
			Ratio
Age Group	Actual	Expected	Actual/Expected
Under 20	0	0.00	0.00
20 - 24	0	0.09	0.00
25 - 29	0	0.42	0.00
30 - 34	0	0.47	0.00
35 - 39	1	1.66	0.60
40 - 44	3	3.97	0.76
45 - 49	1	5.75	0.17
50 - 54	12	8.50	1.41
55 - 59	12	11.26	1.07
60 - 64	6	9.07	0.66
65 & Over	0	3.59	0.00
TOTAL	35	44.78	0.78

Findings and Recommendations

Experience indicates that the current assumption overestimated the number of disability retirements during the experience period. If we combine this experience with the experience from the prior experience study complete for the period ended July 1, 2013 the total number of disability retirements was 73 compared to the expected number of disability retirement which was 75.7. The actual/expected ratio on this basis is 97%, which indicates a closer match to the current assumption. As a result, we recommend making no change to the assumed rates of disability.

The chart below shows (i) the actual disability rates for employees by age during the past five years and (ii) the current assumed disability rates.



Rates of Retirement

Below is a summary of the retirement criteria for Tier One and Tier Two members:

Retirement Type	Tier	Criteria
Early	One	Five years of service and age 50
Normal	One	25 years of service or age 60 with five years of service
Early	Two	Five years of service and age 55
Normal	Two	Age 55 with 30 years of service or age 60 with five years of service

The retirement rates used in the actuarial valuation project the percentage of employees who are expected to retire during the upcoming year. Separate rates are assumed for University and Non-University members. The System is currently closed to university members. As of July 1, 2017 university members comprise less than 2% of the total population with 300 active members with average age and service of 56 and 23 respectively.

In addition to membership type, retirement rates are set based on type of retirement. The rates of retirement were studied separately for those eligible for a reduced benefit, first eligible for an unreduced benefit and beyond first eligibility for an unreduced benefit. An actual/expected ratio that is less than 100% indicates that in general less people retired with a retirement benefit than were anticipated by the current assumption while an actual/expected ratio that is greater than 100% indicates more people have retired than expected during the observation period.

Eligible for a Reduced Benefit

The analysis of the actual retirement experience over the five-year period yields actual/expected ratios of 113% and 82% respectively for Non-University and University members.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Number of Service Retirements Eligible for a Reduced Benefit						
	Current Rates					
	Non-University			Universtiy		
			Ratio			Ratio
Age	Actual	Expected	Actual/Expected	Actual	Expected	Actual/Expected
50	152	142.35	1.07	2	2.24	0.89
51	86	73.00	1.18	0	1.19	0.00
52	87	71.85	1.21	0	1.33	0.00
53	91	72.15	1.26	1	1.68	0.60
54	104	98.19	1.06	3	1.61	1.86
55	100	96.25	1.04	0	1.82	0.00
56	72	91.28	0.79	0	2.03	0.00
57	86	87.57	0.98	1	1.96	0.51
58	135	86.80	1.56	5	1.96	2.55
59	13	3.22	4.04	1	0.07	14.29
TOTAL	926	822.66	1.13	13	15.89	0.82

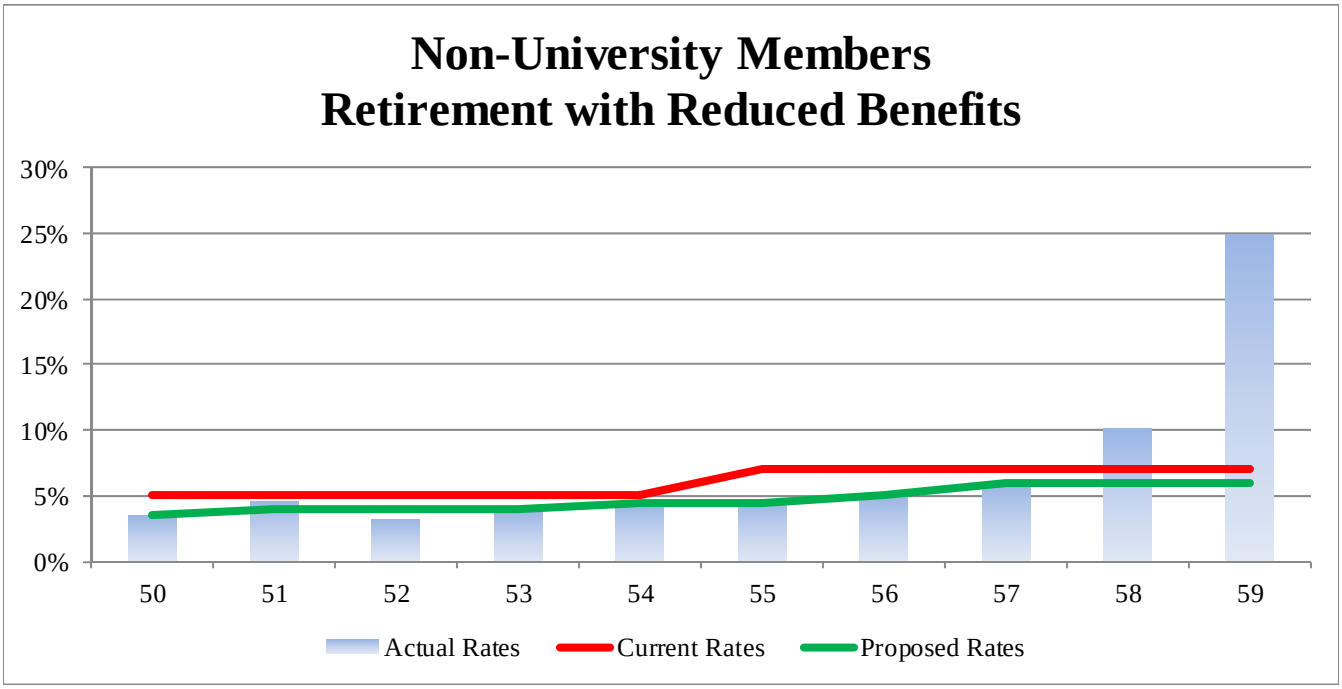
Findings and Recommendations

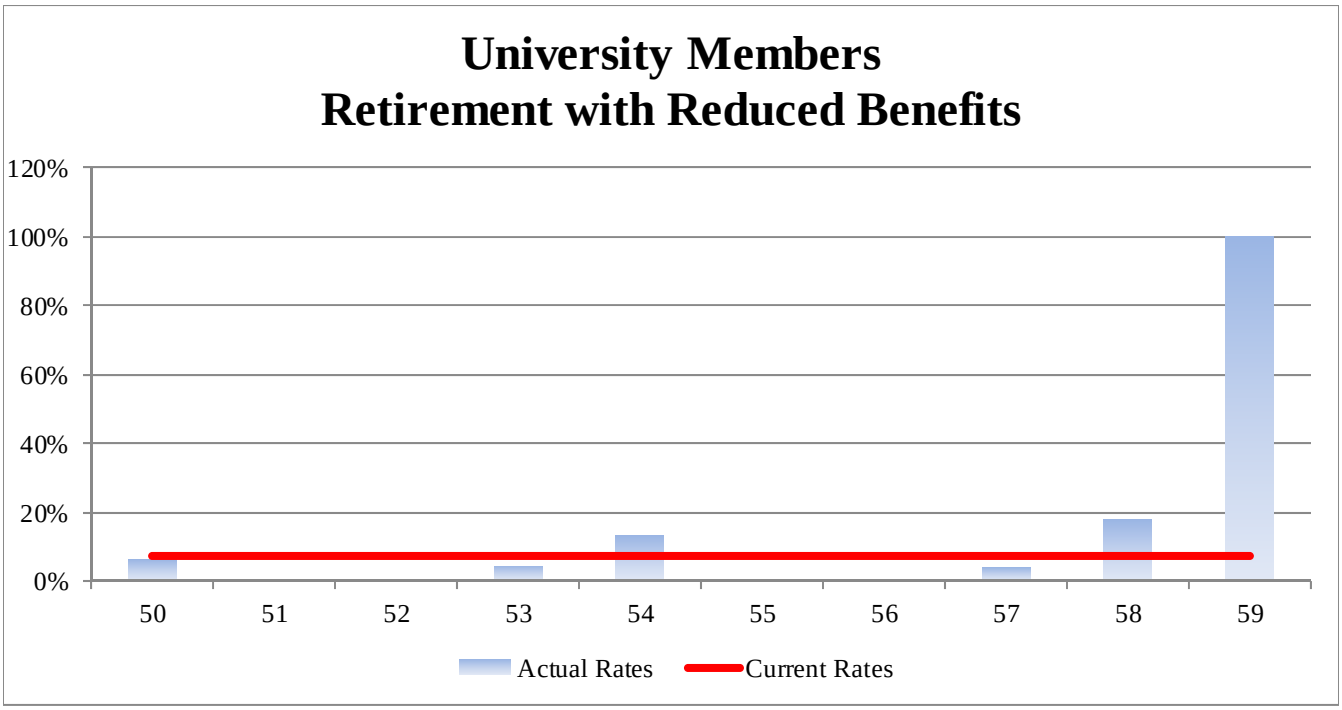
In general, actual retirements for members who were eligible for a reduced benefit were greater than expected for both Non-University and less than expected for University members. We recommend revising the assumed rates of retirement for non-university members. Due to the low number of total lives, we do not recommend updating the assumed rates of retirement for university members.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Number of Service Retirements Eligible for a Reduced Benefit						
	Proposed Rates					
	Non-University			University		
Age	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
50	152	170.82	0.89	2	2.24	0.89
51	86	87.60	0.98	0	1.19	0.00
52	87	86.22	1.01	0	1.33	0.00
53	91	86.58	1.05	1	1.68	0.60
54	104	99.47	1.05	3	1.61	1.86
55	100	96.25	1.04	0	1.82	0.00
56	72	91.28	0.79	0	2.03	0.00
57	86	87.57	0.98	1	1.96	0.51
58	135	86.87	1.55	5	1.96	2.55
59	13	3.43	3.79	1	0.07	14.29
TOTAL	926	896.09	1.03	13	15.89	0.82

The charts below show (i) the actual retirement rates for employees by age during the past five years (ii) the current assumed retirement rates separately for Non-University and University members and (iii) the proposed assumed retirement rates for Non-University members.





First Eligible for an Unreduced Benefit

The analysis of the actual retirement experience over the five-year period yields an actual/expected ratio of 114% and 33% respectively for Non-University and University members respectively.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Number of Service Retirements First Eligible for an Unreduced Benefit						
	Current Rates					
	Non-University			University		
Age	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
45	0	0.24	0.00	0	0.00	0.00
46	6	0.16	37.50	0	0.00	0.00
47	7	3.28	2.13	0	0.00	0.00
48	19	8.48	2.24	0	0.34	0.00
49	23	9.36	2.46	1	0.51	1.96
50	8	6.88	1.16	0	0.51	0.00
51	4	6.88	0.58	0	0.00	0.00
52	5	5.84	0.86	0	0.34	0.00
53	2	5.40	0.37	0	0.68	0.00
54	7	5.13	1.36	1	0.34	2.94
55	4	6.21	0.64	0	0.60	0.00
56	7	9.36	0.75	0	0.30	0.00
57	8	8.27	0.97	0	0.75	0.00
58	12	8.58	1.40	1	0.75	1.33
59	10	9.75	1.03	0	0.60	0.00
60	165	168.65	0.98	0	3.45	0.00
61	5	8.08	0.62	0	0.00	0.00
62	16	8.34	1.92	0	0.00	0.00
63	10	3.18	3.14	0	0.00	0.00
64	9	4.75	1.89	0	0.00	0.00
65	8	12.40	0.65	0	0.00	0.00
66	7	1.49	4.70	0	0.00	0.00
67	4	4.79	0.84	0	0.00	0.00
68	6	1.26	4.76	0	0.00	0.00
69	0	0.72	0.00	0	0.00	0.00
TOTAL	352	307.48	1.14	3	9.17	0.33

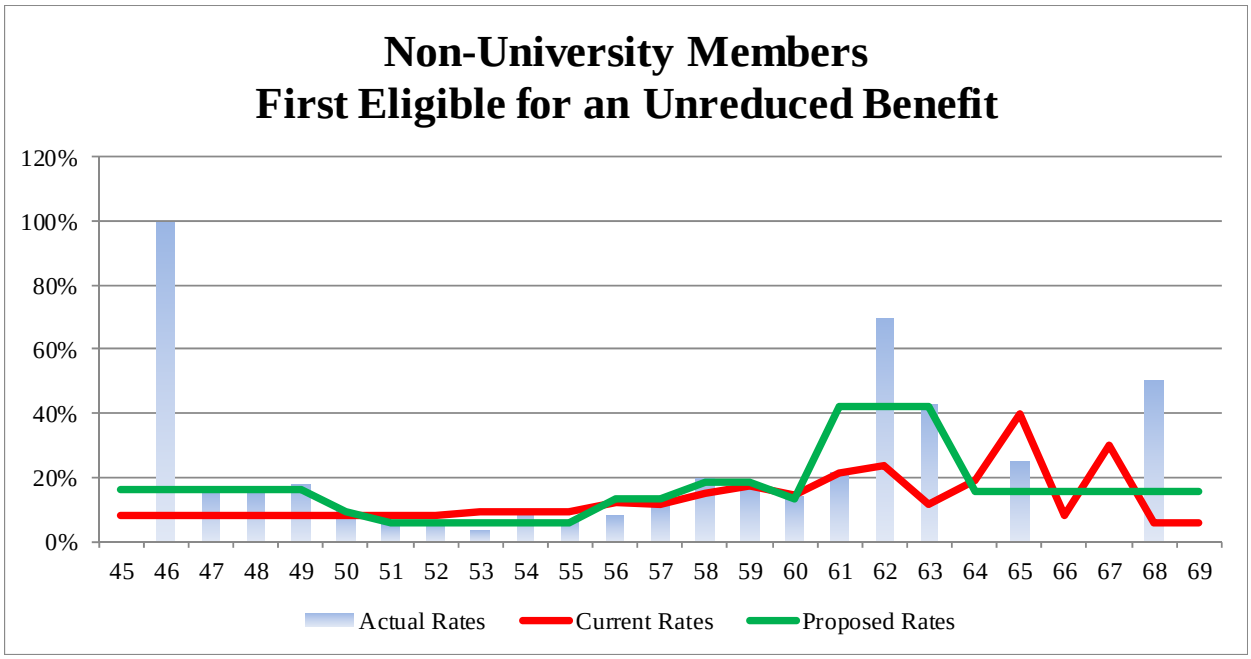
Findings and Recommendations

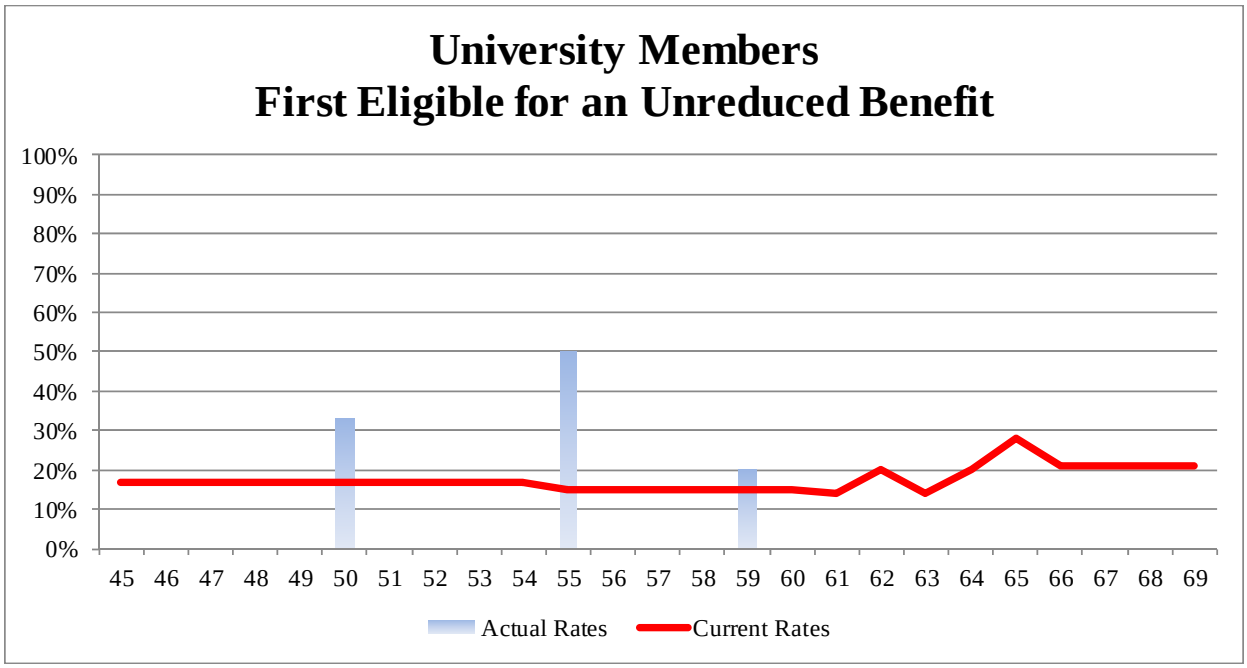
In general, actual retirements for members who were eligible for an unreduced benefit were greater than expected for non-university members and less than expected for university members. We recommend revising the assumed rates of retirement for non-university members. Due to the low number of total lives we do not recommend revising the retirement rates for university members. The table below shows the experience under proposed assumptions.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Number of Service Retirements First Eligible for an Unreduced Benefit						
	Proposed Rates					
	Non-University			University		
			Ratio			Ratio
Age	Actual	Expected	Actual/Expected	Actual	Expected	Actual/Expected
45	0	0.48	0.00	0	0.00	0.00
46	6	1.12	5.36	0	0.00	0.00
47	7	7.20	0.97	0	0.00	0.00
48	19	19.20	0.99	0	0.34	0.00
49	23	21.12	1.09	1	0.51	1.96
50	8	7.74	1.03	0	0.51	0.00
51	4	5.16	0.78	0	0.00	0.00
52	5	4.38	1.14	0	0.34	0.00
53	2	3.60	0.56	0	0.68	0.00
54	7	3.42	2.05	1	0.34	2.94
55	4	4.14	0.97	0	0.60	0.00
56	7	7.02	1.00	0	0.30	0.00
57	8	9.45	0.85	0	0.75	0.00
58	12	10.73	1.12	1	0.75	1.33
59	10	10.36	0.97	0	0.60	0.00
60	165	155.93	1.06	0	3.45	0.00
61	5	8.19	0.61	0	0.00	0.00
62	16	7.98	2.01	0	0.00	0.00
63	10	6.51	1.54	0	0.00	0.00
64	9	8.10	1.11	0	0.00	0.00
65	8	9.30	0.86	0	0.00	0.00
66	7	6.00	1.17	0	0.00	0.00
67	4	4.80	0.83	0	0.00	0.00
68	6	6.60	0.91	0	0.00	0.00
69	0	3.60	0.00	0	0.00	0.00
TOTAL	352	332.13	1.06	3	9.17	0.33

The charts below show (i) the actual rates of retirement for employees by age during past five years and (ii) the current assumed rates of retirement for both non-university and university members.





Beyond First Year of Eligibility for an Unreduced Benefit

The analysis of the actual retirement experience over the five-year period yields an actual/expected ratio of 102% and 82% respectively for Non-University and University members respectively.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Number of Service Retirements Beyond First Year of Eligibility for an Unreduced Benefit						
	Current Rates					
	Non-University			University		
Age	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
45	0	0.11	0.00	0	0.00	0.00
46	2	0.49	4.08	0	0.00	0.00
47	3	0.51	5.88	0	0.00	0.00
48	6	2.88	2.08	0	0.00	0.00
49	3	7.90	0.38	0	0.08	0.00
50	16	14.89	1.07	1	0.24	4.17
51	16	22.87	0.70	1	0.48	2.08
52	39	36.48	1.07	1	0.56	1.79
53	39	38.47	1.01	0	0.48	0.00
54	51	44.69	1.14	0	0.80	0.00
55	64	58.01	1.10	1	1.44	0.69
56	85	71.97	1.18	2	1.68	1.19
57	76	85.66	0.89	0	2.00	0.00
58	78	94.71	0.82	0	2.64	0.00
59	126	107.29	1.17	4	3.76	1.06
60	140	115.43	1.21	6	4.75	1.26
61	373	410.75	0.91	12	11.99	1.00
62	278	340.75	0.82	9	14.82	0.61
63	212	282.50	0.75	7	12.44	0.56
64	293	235.75	1.24	16	15.66	1.02
65	272	240.80	1.13	20	20.02	1.00
66	116	90.60	1.28	9	12.81	0.70
67	108	66.80	1.62	12	13.75	0.87
68	64	44.80	1.43	8	9.96	0.80
69	45	32.20	1.40	7	11.40	0.61
TOTAL	2,505	2,447.31	1.02	116	141.76	0.82

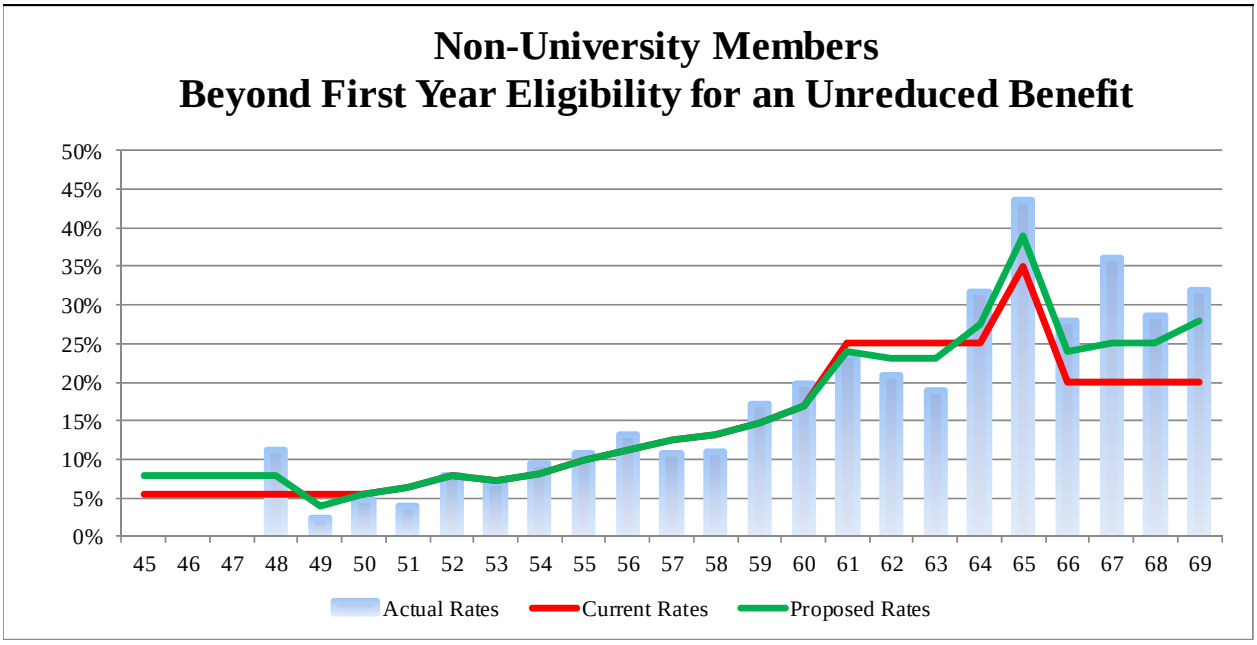
Findings and Recommendations

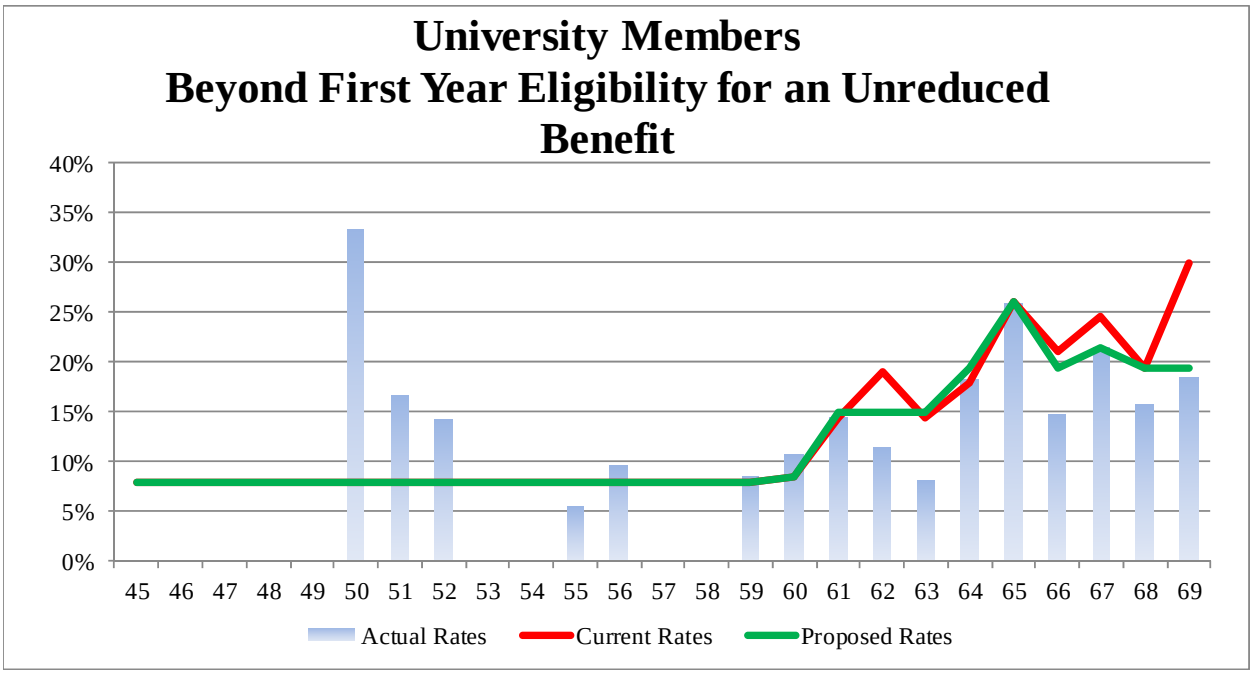
The actual retirements for members were greater than expected for non-university members and less than expected for university members. We recommend revising the assumed rates of retirement for both non-university members and university members. The table below shows the experience under proposed assumptions.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Number of Service Retirements Beyond First Year of Eligibility for an Unreduced Benefit						
	Proposed Rates					
	Non-University			University		
			Ratio			Ratio
Age	Actual	Expected	Actual/Expected	Actual	Expected	Actual/Expected
45	0	0.16	0.00	0	0.00	0.00
46	2	0.72	2.78	0	0.00	0.00
47	3	0.72	4.17	0	0.00	0.00
48	6	4.16	1.44	0	0.00	0.00
49	3	8.64	0.35	0	0.08	0.00
50	16	14.90	1.07	1	0.24	4.17
51	16	22.87	0.70	1	0.48	2.08
52	39	36.48	1.07	1	0.56	1.79
53	39	38.47	1.01	0	0.48	0.00
54	51	44.69	1.14	0	0.80	0.00
55	64	58.01	1.10	1	1.44	0.69
56	85	71.98	1.18	2	1.68	1.19
57	76	85.63	0.89	0	2.00	0.00
58	78	94.71	0.82	0	2.64	0.00
59	126	107.30	1.17	4	3.76	1.06
60	140	135.80	1.03	6	4.76	1.26
61	373	394.32	0.95	12	12.45	0.96
62	278	313.49	0.89	9	11.70	0.77
63	212	259.90	0.82	7	12.90	0.54
64	293	259.33	1.13	16	16.97	0.94
65	272	268.32	1.01	20	20.02	1.00
66	116	113.25	1.02	9	11.90	0.76
67	108	83.50	1.29	12	12.04	1.00
68	64	56.00	1.14	8	9.95	0.80
69	45	40.25	1.12	7	7.41	0.94
TOTAL	2,505	2,513.61	1.00	116	134.25	0.86

The charts below show (i) the actual retirement rates by age, (ii) the current assumed rates of retirement for both non-university and university members and (iii) the proposed rates of retirement for both non-university and university members.





Rates of Mortality

Mortality tables are a fundamental assumption in actuarial valuations. Because benefits are typically paid over a retiree's lifetime, it is important to appropriately reflect what a typical lifetime looks like. In addition, deaths before retirement may also result in the payout of benefits to a spouse or survivor. For valuation purposes, we must consider mortality tables for retirees, beneficiaries of retirees, disabled retirees, and active members.

The post-retirement mortality rates used in the actuarial valuation project the percentage of retirees who are expected to die in a given future year. This assumption is a very important demographic assumption since it typically has the most significant impact on liability projections.

Based upon the long term trend of mortality improvement, actuaries seek to account for future improvements in longevity, either by directly projecting future improvements or by maintaining a sufficient margin in expected rates of mortality to allow for future improvement. We propose that the selected table reflect some degree of future improvement now, thereby providing a margin for improvement.

The number of deaths among active members is not large enough to provide statistics credible enough to develop a unique table. Therefore, it is assumed that pre-retirement mortality follows the same table for healthy post-retirement mortality.

Retiree and Beneficiary Mortality

The analysis of the actual post-retirement mortality experience over the five-year experience study period yields actual/expected ratios of 123% and 106% respectively for males and females. The table below details the actual/expected ratios by individual age group and total.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

	Post-Retirement Mortality Experience					
	Males			Females		
Age Group	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
Under 50	4	0.25	16.00	3	0.19	15.79
50 - 54	2	1.13	1.77	3	1.40	2.14
55 - 59	9	7.13	1.26	7	7.83	0.89
60 - 64	13	25.58	0.51	34	42.55	0.80
65 - 69	62	63.84	0.97	49	89.98	0.54
70 - 74	81	89.10	0.91	61	100.68	0.61
75 - 79	123	101.70	1.21	109	108.66	1.00
80 - 84	162	119.73	1.35	137	129.06	1.06
85 - 89	147	102.82	1.43	172	151.51	1.14
90 - 94	103	67.39	1.53	213	152.83	1.39
95 - 99	39	23.73	1.64	135	95.61	1.41
100 & Over	6	6.70	0.90	39	30.05	1.30
TOTAL	751	609.10	1.23	962	910.35	1.06

Findings and Recommendations

Experience indicates that overall more male and female members have died than were anticipated during the study period. The table currently in use is the 1992 Base Rates form the RP 2000 Healthy Annuitant Mortality Table for ages 50 above and the 1992 Base Rates from the RP 2000 Combined Healthy Annuitant Mortality Table for ages below 50, set back four years and two years for males and females respectively projected by scale BB to 2018.

The mortality margin for males and females is 23% and 6% respectively. While the margin for improvement is sufficient for males it is not sufficient for females. As a result, we recommend updating the mortality assumption which contains a sufficient margin for both males and females.

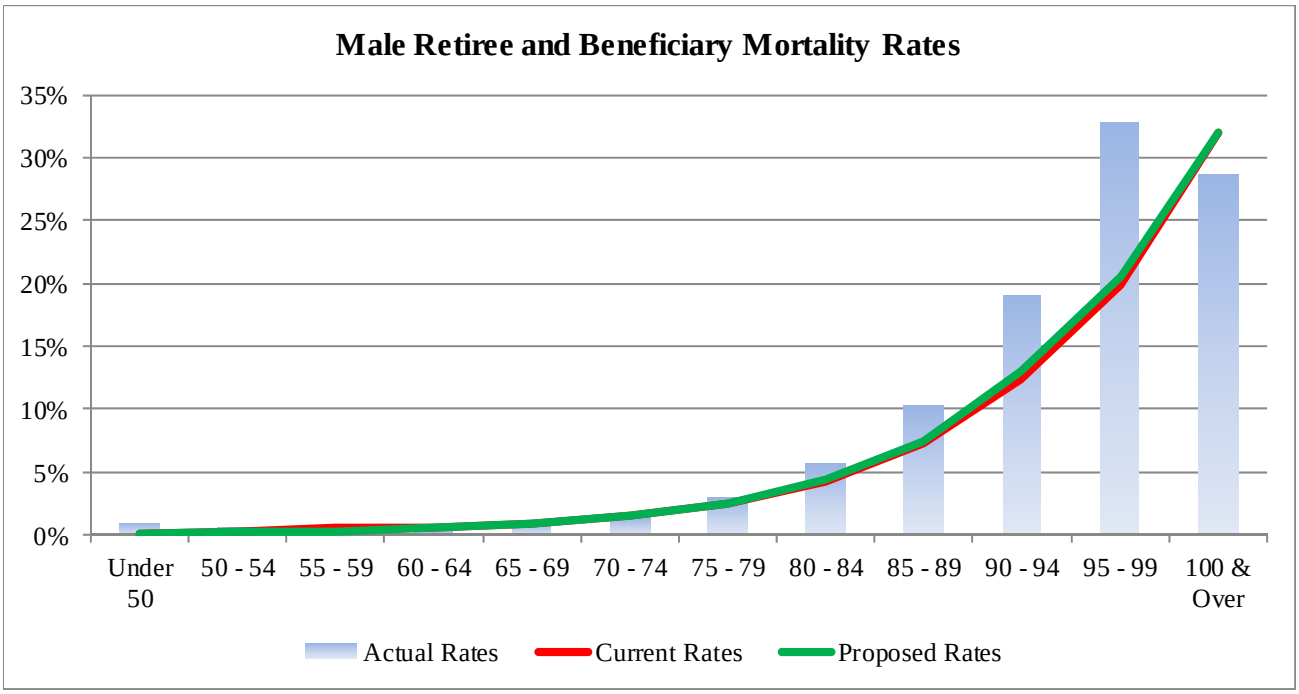
We recommend updating assumed male and female mortality assumption. We developed the assumption in two steps. First, in general, the RP 2000 Combined Healthy Mortality table is a better overall fit to the actual mortality experience of the System. Therefore, we recommend the post retirement healthy mortality assumption to the RP 2000 Combined Healthy Mortality Table projected to 2022 adjusted for partial credibility setback for two years for both males and females.

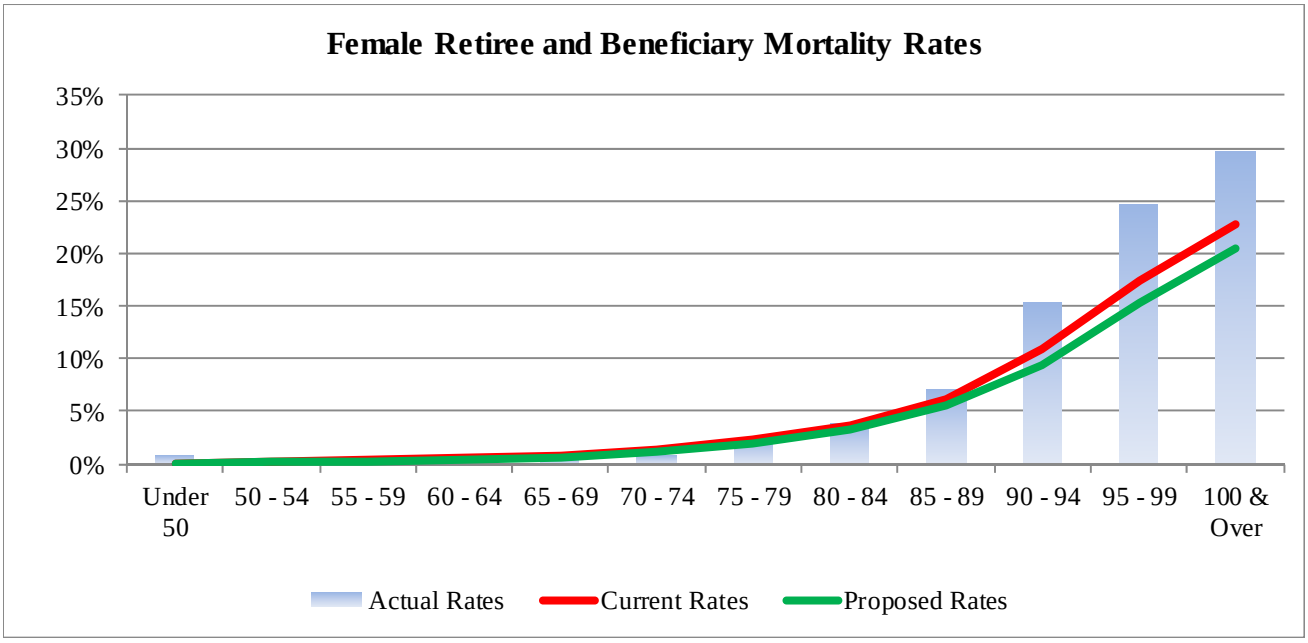
EXPERIENCE UNDER PROPOSED ASSUMPTIONS

The actual/expected ratios under the proposed assumptions are 122% compared to 123% for males and 122% compared to 106% for females. The recommended table provides sufficient margin for mortality improvement in the future. The table below details the actual/expected ratios by individual age group and total.

	Post-Retirement Mortality Experience					
	Males			Females		
Age Group	Actual	Proposed	Ratio Actual/Expected	Actual	Proposed	Ratio Actual/Expected
Under 50	4	0.30	13.19	3	0.20	14.96
50 - 54	2	0.81	2.46	3	1.02	2.93
55 - 59	9	4.33	2.08	7	5.75	1.22
60 - 64	13	22.43	0.58	34	32.23	1.05
65 - 69	62	64.03	0.97	49	74.76	0.66
70 - 74	81	89.30	0.91	61	88.41	0.69
75 - 79	123	104.09	1.18	109	96.21	1.13
80 - 84	162	122.38	1.32	137	114.27	1.20
85 - 89	147	105.47	1.39	172	134.15	1.28
90 - 94	103	70.20	1.47	213	131.59	1.62
95 - 99	39	24.50	1.59	135	84.05	1.61
100 & Over	6	6.71	0.89	39	27.12	1.44
TOTAL	751	614.54	1.22	962	789.77	1.22

The charts below show (i) actual mortality rates for retirees by age group, (ii) the currently assumed mortality rates for retirees and (iii) the recommended mortality rates for retirees and beneficiaries.





Rates of Disabled Post-Retirement Mortality

The disability mortality rates used in the actuarial valuations project the percentage of disabled retirees who are expected to die in the upcoming year for both Non-University and University Members. Mortality for disabled retirees is expected to be higher than mortality for non-disabled retirees.

The analysis of the actual disabled mortality over the five-year experience study period yields actual/expected ratio of 88% and 89% respectively for disabled male and female retirees respectively. The table below shows the actual/expected ratios by age groups and in total.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

	Post-Disablement Mortality Experience					
	Males			Females		
Age Group	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
Under 25	0	0.00	0.00	0	0.00	0.00
25 - 29	0	0.00	0.00	0	0.00	0.00
30 - 34	0	0.00	0.00	0	0.00	0.00
35 - 39	0	0.00	0.00	0	0.03	0.00
40 - 44	0	0.10	0.00	1	0.05	20.00
45 - 49	0	0.22	0.00	0	0.28	0.00
50 - 54	1	0.68	1.47	2	0.98	2.04
55 - 59	1	0.63	1.59	8	1.94	4.12
60 - 64	3	2.11	1.42	4	3.95	1.01
65 - 69	4	2.49	1.61	5	5.96	0.84
70 - 74	3	2.02	1.49	1	4.69	0.21
75 - 79	0	1.99	0.00	4	4.53	0.88
80 - 84	0	2.91	0.00	1	2.33	0.43
85 - 89	2	1.41	1.42	1	3.30	0.30
90 - 94	1	1.68	0.60	0	1.48	0.00
95 - 99	0	0.81	0.00	0	0.92	0.00
100 & Over	0	0.00	0.00	0	0.00	0.00
TOTAL	15	17.05	0.88	27	30.44	0.89

Findings and Recommendations

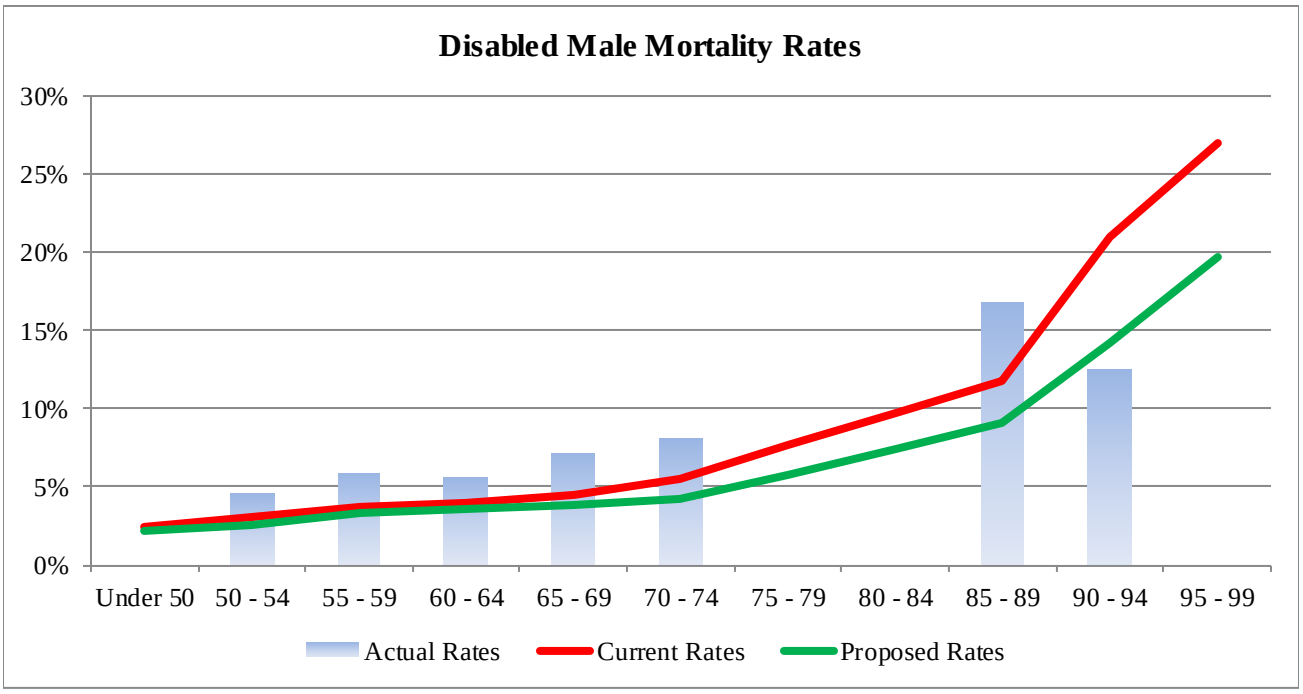
Experience indicates that overall less disabled retired members have died than expected during the study period. The table currently in use is the RP-2000 Disabled Mortality, setback one year for males and set forward five years for females with mortality improvement projected by Scale BB to 2018.

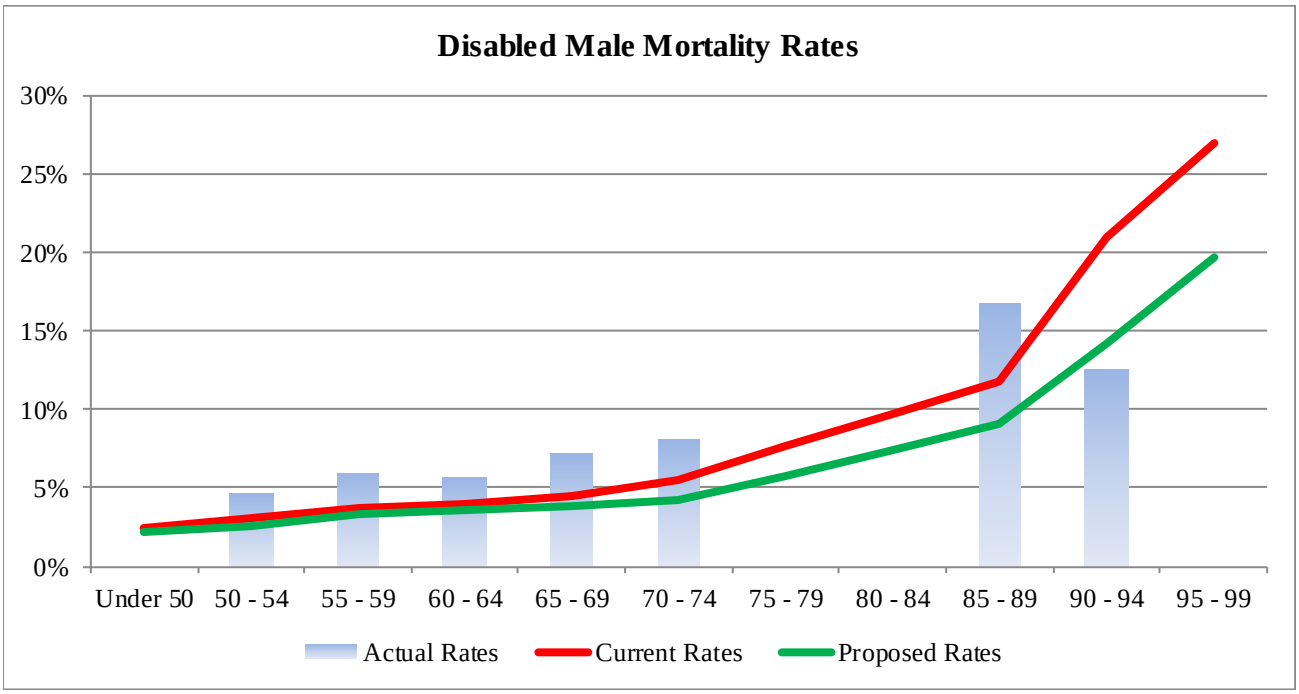
In order to maintain consistency with the healthy mortality assumption we recommend updating the post retirement disabled mortality table to the RP-2000 Disabled Mortality projected by Scale BB to 2022 setback three years and set forward two years for males and females respectively. The actual/expected ratio under the proposed assumptions is 111% for both males and females. The proposed assumption maintains sufficient margin for mortality improvement over the next experience period.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

	Post-Disablement Mortality Experience					
	Males			Females		
Age Group	Actual	Proposed	Ratio Actual/Expected	Actual	Proposed	Ratio Actual/Expected
Under 25	0	0.00	0.00	0	0.00	0.00
25 - 29	0	0.00	0.00	0	0.00	0.00
30 - 34	0	0.00	0.00	0	0.00	0.00
35 - 39	0	0.00	0.00	0	0.02	0.00
40 - 44	0	0.11	0.00	1	0.04	24.00
45 - 49	0	0.17	0.00	0	0.22	0.00
50 - 54	1	0.56	1.79	2	0.79	2.53
55 - 59	1	0.56	1.80	8	1.55	5.15
60 - 64	3	1.89	1.59	4	3.17	1.26
65 - 69	4	2.13	1.88	5	4.70	1.06
70 - 74	3	1.56	1.92	1	3.68	0.27
75 - 79	0	1.49	0.00	4	3.56	1.13
80 - 84	0	2.21	0.00	1	1.82	0.55
85 - 89	2	1.09	1.83	1	2.60	0.38
90 - 94	1	1.13	0.88	0	1.28	0.00
95 - 99	0	0.59	0.00	0	0.84	0.00
100 & Over	0	0.00	0.00	0	0.00	0.00
TOTAL	15	13.49	1.11	27	24.27	1.11

The charts below show (i) actual mortality rates for disabled retirees by age during the past five years (ii) the currently assumed disabled mortality rates, and (iii) the proposed disabled mortality rates.





Rates of Salary Increase

The analysis of salary increases yielded an actual/expected ratio of 100% and 98% for non-university members and university members respectively. A ratio less than 100% indicates that salary increases in general were less than anticipated by the current assumption. We recommend no change to the salary scale other than the reduction due to the lowering of the wage base component of the total salary increase assumption from 4.00% to 3.25%.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

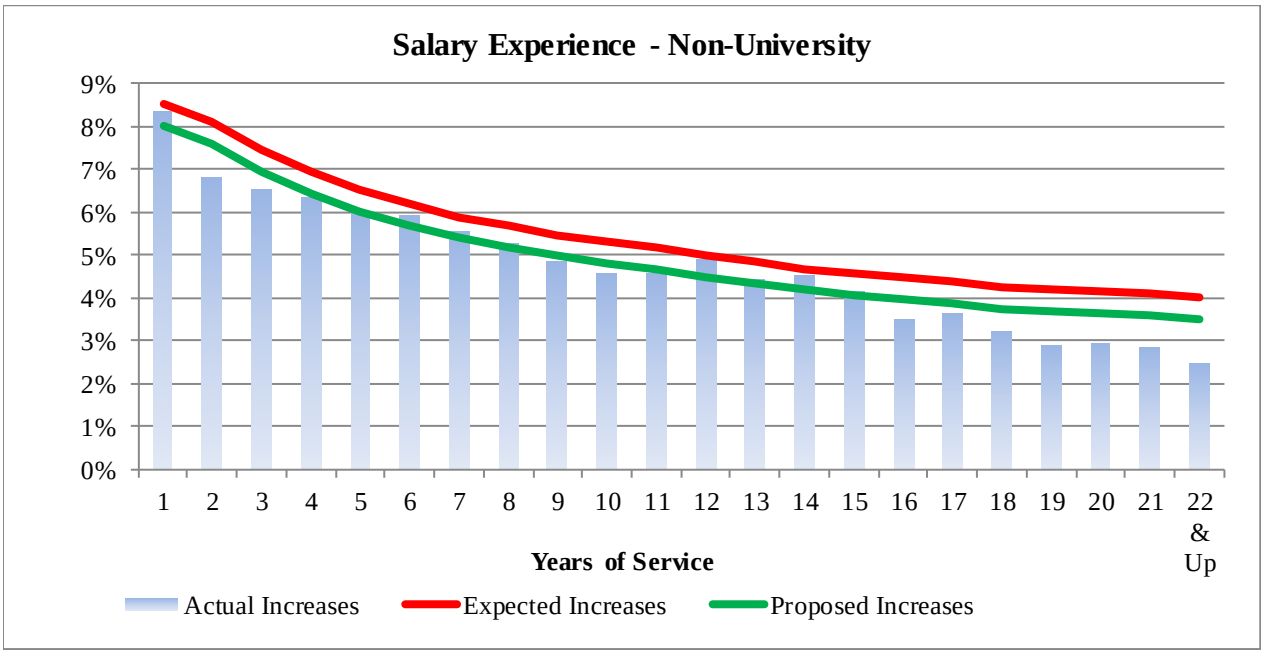
Years of Service	Salaries End of Year (in thousands)					
	Non-University Members			University Members		
	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
1	291,925	302,060	0.966	697	658	1.059
2	142,360	143,213	0.994	564	583	0.968
3	132,208	132,698	0.996	679	734	0.926
4	125,621	125,847	0.998	729	738	0.988
5	126,919	127,132	0.998	1,113	1,120	0.994
6	129,221	129,171	1.000	1,058	1,014	1.043
7	128,363	128,547	0.999	1,193	1,159	1.030
8	123,251	123,466	0.998	872	932	0.936
9	115,362	115,888	0.995	1,032	1,016	1.015
10	115,540	116,207	0.994	879	947	0.928
11	112,588	113,046	0.996	1,056	1,095	0.964
12	113,058	113,017	1.000	692	692	1.000
13	111,569	111,825	0.998	768	773	0.994
14	111,362	111,415	1.000	1,116	1,195	0.934
15	107,500	107,846	0.997	947	983	0.964
16	102,494	103,334	0.992	879	926	0.950
17	98,472	99,062	0.994	1,416	1,449	0.977
18	98,225	99,162	0.991	1,939	2,021	0.959
19	96,179	97,348	0.988	2,447	2,441	1.003
20	94,032	95,074	0.989	3,652	3,772	0.968
21	93,193	94,228	0.989	4,286	4,384	0.978
22 & Up	698,248	708,430	0.986	77,784	79,592	0.977
TOTAL	3,267,691	3,298,014	0.990	105,800	108,224	0.980

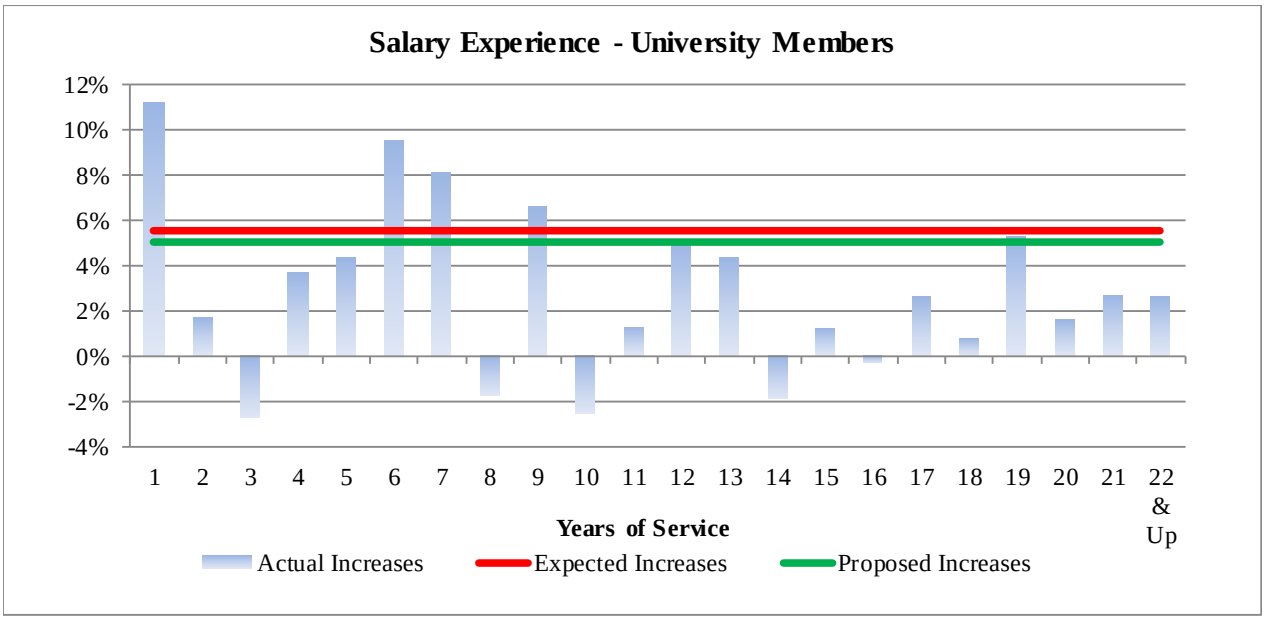
The following graphs show a comparison of current, actual and proposed rates of salary increase for Non-University members and for University members.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Years of Service	Salaries End of Year (in thousands)					
	Non-University Members			University Members		
	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
1	291,925	290,994	1.003	697	655	1.064
2	142,360	143,386	0.993	564	580	0.973
3	132,208	132,723	0.996	679	730	0.931
4	125,621	125,752	0.999	729	734	0.993
5	126,919	126,905	1.000	1,113	1,114	0.998
6	129,221	128,952	1.002	1,058	1,009	1.048
7	128,363	128,194	1.001	1,193	1,153	1.035
8	123,251	123,126	1.001	872	928	0.940
9	115,362	115,514	0.999	1,032	1,011	1.020
10	115,540	115,820	0.998	879	943	0.933
11	112,588	112,680	0.999	1,056	1,090	0.969
12	113,058	112,651	1.004	692	689	1.005
13	111,569	111,462	1.001	768	769	0.999
14	111,362	110,988	1.003	1,116	1,189	0.939
15	107,500	107,443	1.001	947	978	0.969
16	102,494	102,938	0.996	879	922	0.954
17	98,472	98,692	0.998	1,416	1,442	0.982
18	98,225	98,734	0.995	1,939	2,011	0.964
19	96,179	96,927	0.992	2,447	2,429	1.007
20	94,032	94,663	0.993	3,652	3,754	0.973
21	93,193	93,875	0.993	4,286	4,363	0.982
22 & Up	698,248	705,024	0.990	77,784	79,213	0.982
TOTAL	3,267,691	3,277,442	1.000	105,800	107,708	0.980

The charts below show (i) actual salary increases by years of service (ii) the currently assumed salary increases, and (iii) the proposed salary increase rates.





Percent Married: Currently 100% of members are assumed to be married. The spouse is assumed to be the same age as the eligible member. This is a common and reasonable assumption and we recommend maintaining this assumption.

Missing Data: In preparing the valuation data, certain data items are missing, unavailable, or unreasonable. In such cases, we have developed assumptions for what the data element should be. We recommend keeping these assumptions.

Part-time employees: The valuation data for active members identify part-time members. Part-time members earning less than $1000 during any given year are valued at current member contribution balance. We recommend keeping this assumption.

Benefits for Terminating Members: Members terminating with less than 5 years of service are assumed to request an immediate withdrawal of their contributions with interest. A probability is assumed for members terminating with 5 or more years of service for the likelihood of retaining membership in the System. Participants who retain membership are due a vested benefit upon reaching normal retirement while members who do not retain membership are entitled to an immediate refund of the member's contributions with interest. We recommend no change in this assumption at this time.

Actuarial valuations utilize methods to determine the liabilities, assets, and costs. While these are not like other assumptions that may change over time, an experience study is still a good opportunity to review these methods to see if they are still appropriate for systematically funding the promised benefits. Significant methods are described below.

Actuarial Cost Method: The cost method is used to allocate the present value of benefits between past service (actuarial accrued liability) and future service (normal cost). Currently the valuation uses the entry age normal cost method. This is the most widely used cost method of large public sector plans and has demonstrated the highest degree of stability as compared to alternative methods. We recommend no change in the use of this method.

Actuarial Value of Assets: The purpose of the asset smoothing is to dampen the impact that market volatility has on valuation results by spreading the unexpected market gains and losses over several years. Currently the System uses smoothing method that recognizes 25% of the difference between the actual and expected market value of assets, based on the assumed rate of return. The actuarial value of assets cannot be less than 80% or more than 120% of market value. We recommend no change in the use of this method.

Amortization Method: The unfunded actuarial accrued liability is amortized using a level percentage of payroll method over the amortization period. Under the level percentage of payroll method, amortization payments will not be large enough to cover interest on the UAL in the beginning of the amortization schedule, which means that as a dollar amount the UAL is expected to grow. After a period of time, amortization payments will be large enough that the amortization payments will cover both interest and principal, and the UAL as a dollar amount will be projected to decrease in each subsequent year. The payroll growth assumption is used to determine the percentage of payroll required over the remaining amortization period to fully amortize the unfunded liability. The current wage inflation assumption is being changed from 4.00% to 3.25%. We recommend the same change for the payroll growth assumption be made. Payroll growth has averaged 2.25% since 2009. In addition to reducing the payroll growth assumption to 3.25% we also recommend phasing in 0.10% reductions each year for the next ten years until the ultimate payroll growth assumption of 2.25% is achieved.

Amortization payments are calculated as increasing each year. If future experience follows the actuarial assumptions, this should result in amortization payments that align with the assumed growth in overall compensation. It is important to note, that the normal cost rate for Tier Two members is less than Tier One members. As Tier One members terminate or retire, and are replaced with a Tier Two member with a lower normal cost rate, more of the employer contribution will be available to amortize the unfunded accrued liability. As a result the effective amortization period is less than the amortization period calculated in the actuarial valuation which does not reflect new hires.

The table below shows the amortization period and the effective amortization period under various payroll growth assumptions.

Payroll Growth Rate	Amortization Period	Effective Amortization Period
3.25% - 2.25%	33	31
3.25%	29	28
3.00%	30	29
2.50%	34	32
2.00%	39	37
1.50%	50	45
1.00%	Does Not Amortize	77

Assumption Changes

As a result of the experience investigation, we are recommending the following:

- Revised rates of termination
- Revise rates of retirement for non-university members.
- Revised rates of pre and post retirement mortality for both healthy and disabled retirements
- Decreasing the wage inflation assumption from 4.00% to 3.25%
- Decreasing the assumed rate of inflation from 3.25% to 2.50%.
- Decrease payroll growth assumption from 4.00% to 2.25% by phasing in 0.10% reductions each year from 3.25% over a ten year period beginning with the July 1, 2018 valuation.

The change in results represents the financial impact of adopting the proposed assumptions.

	Valuation July 1, 2017	Demographic Assumption Changes	Economic & Demographic Assumption Changes
Employer Contribution Rate:			
Normal Rate	1.67%	2.07%	1.70%
Admin. Expense Load	0.33%	0.33%	0.33%
UAAL	9.36%	8.96%	9.33%
Total Statutory Employer Rate	11.36%	11.36%	11.36%
Actuarial Accrued Liabillity*	$5,636,842	$5,720,959	$5,810,410
Actuarial Value of Assets*	3,973,519	3,973,519	3,973,519
UAAL*	$1,663,323	$1,747,440	$1,836,891
Amortization Period	22	25	33

* In thousands

Historical June CPI (U) Index

Year	CPI (U)	Year	CPI (U)
1960	29.60	1989	124.10
1961	29.80	1990	129.90
1962	30.20	1991	136.00
1963	30.60	1992	140.20
1964	31.00	1993	144.40
1965	31.60	1994	148.00
1966	32.40	1995	152.50
1967	33.30	1996	156.70
1968	34.70	1997	160.30
1969	36.60	1998	163.00
1970	38.80	1999	166.20
1971	40.60	2000	172.40
1972	41.70	2001	178.00
1973	44.20	2002	179.90
1974	49.00	2003	183.70
1975	53.60	2004	189.70
1976	56.80	2005	194.50
1977	60.70	2006	202.90
1978	65.20	2007	208.35
1979	72.30	2008	218.82
1980	82.70	2009	215.69
1981	90.60	2010	217.97
1982	97.00	2011	225.72
1983	99.50	2012	229.48
1984	103.70	2013	233.50
1985	107.60	2014	238.34
1986	109.50	2015	238.64
1987	113.50	2016	241.02
1988	118.00	2017	244.96

RVKuhns Capital Market Assumptions and Asset Allocation

Rates of Return and Standard Deviation by Asset Class

Asset Class	Return	Standard Deviation
Domestic Equity	4.55%	17.80%
International Equity	6.35%	20.65%
Private Equity	7.50%	25.50%
Natural Resources	5.50%	24.00%
Core Real-Estate	5.25%	12.50%
TIPS	1.25%	6.25%
Intermediate Duration Bonds	1.00%	6.00%
High Yield Bonds	3.50%	15.00%
Cash	-0.25%	3.00%

Asset Class Correlation Coefficients

	Domestic Equity	International Equity	Private Equity	Natural Resources	Core Real-Estate	TIPS	Intermediate Duration Bonds	High Yield Bonds	Cash
Domestic Equity	1.00	0.82	0.78	0.60	0.25	0.02	0.16	0.62	0.03
International Equity	0.82	1.00	0.74	0.75	0.27	0.16	0.02	0.69	-0.04
Private Equity	0.78	0.74	1.00	0.67	0.57	-0.01	-0.29	0.56	-0.21
Natural Resources	0.60	0.75	0.67	1.00	0.36	0.49	0.28	0.63	0.03
Core Real-Estate	0.25	0.27	0.57	0.36	1.00	0.09	-0.06	0.08	0.01
TIPS	0.02	0.16	-0.01	0.49	0.09	1.00	0.78	0.30	0.08
Intermediate Duration Bonds	0.16	0.02	-0.29	0.28	-0.06	0.78	1.00	0.25	0.26
High Yield Bonds	0.62	0.69	0.56	0.63	0.08	0.30	0.25	1.00	-0.03
Cash	0.03	-0.04	-0.21	0.03	0.01	0.08	0.26	-0.03	1.00

Survey of Capital Market Assumptions: 2017 Edition

Capital Market Assumptions and Asset Allocation

Rates of Return and Standard Deviation by Asset Class

Asset Class	Return	Standard Deviation
Domestic Equity	6.68%	16.58%
International Equity	6.98%	18.86%
Private Equity	10.15%	21.98%
Natural Resources	4.09%	17.89%
Core Real-Estate	5.38%	14.52%
TIPS	1.78%	6.32%
Intermediate Duration Bonds	2.15%	5.50%
High Yield Bonds	4.36%	10.61%
Cash	0.81%	2.97%

Asset Class Correlation Coefficients

	Domestic Equity	International Equity	Private Equity	Natural Resources	Core Real-Estate	TIPS	Intermediate Duration Bonds	High Yield Bonds	Cash
Domestic Equity	1.00	0.81	0.73	0.32	0.43	0.06	0.13	0.62	-0.10
International Equity	0.81	1.00	0.81	0.41	0.39	0.12	0.14	0.61	-0.08
Private Equity	0.73	0.81	1.00	0.33	0.40	0.02	0.04	0.51	-0.10
Natural Resources	0.32	0.41	0.33	1.00	0.22	0.27	0.09	0.35	-0.02
Core Real-Estate	0.43	0.39	0.40	0.22	1.00	0.11	0.07	0.32	0.01
TIPS	0.06	0.12	0.02	0.27	0.11	1.00	0.69	0.29	0.35
Intermediate Duration Bonds	0.13	0.14	0.04	0.09	0.07	0.69	1.00	0.36	0.13
High Yield Bonds	0.62	0.61	0.51	0.35	0.32	0.29	0.36	1.00	-0.05
Cash	-0.10	-0.08	-0.10	-0.02	0.01	0.35	0.13	-0.05	1.00

Asset Allocation Targets

Asset Class	Allocation Percentage
Domestic Equity	35.00%
International Equity	18.00%
Private Equity	10.00%
Natural Resources	3.00%
Core Real-Estate	7.00%
TIPS	3.00%
Intermediate Duration Bonds	19.00%
High Yield Bonds	3.00%
Cash	2.00%

Social Security Administration Wage Index

Year	Wage Index	Annual Increase	Year	Wage Index	Annual Increase
1959	$3,855.80		1988	$19,334.04	4.93%
1960	4,007.12	3.92%	1989	20,099.55	3.96
1961	4,086.76	1.99	1990	21,027.98	4.62
1962	4,291.40	5.01	1991	21,811.60	3.73
1963	4,396.64	2.45	1992	22,935.42	5.15
1964	4,576.32	4.09	1993	23,132.67	0.86
1965	4,658.72	1.80	1994	23,753.53	2.68
1966	4,938.36	6.00	1995	24,705.66	4.01
1967	5,213.44	5.57	1996	25,913.90	4.89
1968	5,571.76	6.87	1997	27,426.00	5.84
1969	5,893.76	5.78	1998	28,861.44	5.23
1970	6,186.24	4.96	1999	30,469.84	5.57
1971	6,497.08	5.02	2000	32,154.82	5.53
1972	7,133.80	9.80	2001	32,921.92	2.39
1973	7,580.16	6.26	2002	33,252.09	1.00
1974	8,030.76	5.94	2003	34,064.95	2.44
1975	8,630.92	7.47	2004	35,648.55	4.65
1976	9,226.48	6.90	2005	36,952.94	3.66
1977	9,779.44	5.99	2006	38,651.41	4.60
1978	10,556.03	7.94	2007	40,405.48	4.54
1979	11,479.46	8.75	2008	41,334.97	2.30
1980	12,513.46	9.01	2009	40,711.61	(1.51)
1981	13,773.10	10.07	2010	41,673.83	2.36
1982	14,531.34	5.51	2011	42,979.61	3.13
1983	15,239.24	4.87	2012	44,321.67	3.12
1984	16,135.07	5.88	2013	44,888.16	1.28
1985	16,822.51	4.26	2014	46,481.52	3.55
1986	17,321.82	2.97	2015	48,098.63	3.48
1987	18,426.51	6.38	2016	48,642.00	1.13

Recommended Mortality Tables

Age	Rates of Mortality Healthy Annuitants		Rates of Mortality Disabled Annuitants		Age	Rates of Mortality Healthy Annuitants		Rates of Mortality Disabled Annuitants	
	Male	Female	Male	Female		Male	Female	Male	Female
17	0.0239%	0.0148%	2.1127%	0.6973%	69	1.1186%	0.8666%	3.9152%	3.0777%
18	0.0252%	0.0154%	2.1127%	0.6973%	70	1.2162%	0.9580%	3.9929%	3.2856%
19	0.0268%	0.0160%	2.1127%	0.6973%	71	1.3476%	1.0588%	4.0811%	3.5093%
20	0.0281%	0.0164%	2.1127%	0.6973%	72	1.5112%	1.1929%	4.2750%	3.7490%
21	0.0294%	0.0165%	2.1127%	0.6973%	73	1.6721%	1.3238%	4.4880%	4.0047%
22	0.0307%	0.0166%	2.1127%	0.6973%	74	1.8566%	1.4724%	4.7216%	4.2767%
23	0.0317%	0.0167%	2.1127%	0.6973%	75	2.0679%	1.6366%	4.9772%	4.5656%
24	0.0325%	0.0169%	2.1127%	0.6973%	76	2.3070%	1.8140%	5.2560%	4.8723%
25	0.0331%	0.0171%	2.1127%	0.6973%	77	2.5747%	2.0026%	5.5586%	5.1980%
26	0.0334%	0.0175%	2.1127%	0.6973%	78	2.8698%	2.2064%	5.8853%	5.5445%
27	0.0334%	0.0180%	2.1127%	0.6973%	79	3.1922%	2.4301%	6.2355%	5.9143%
28	0.0336%	0.0186%	2.1127%	0.6973%	80	3.5472%	2.6787%	6.6083%	6.3102%
29	0.0340%	0.0194%	2.1127%	0.6973%	81	3.9421%	2.9574%	7.0020%	6.7350%
30	0.0349%	0.0204%	2.1127%	0.6973%	82	4.3805%	3.2690%	7.4145%	7.1916%
31	0.0366%	0.0216%	2.1127%	0.6973%	83	4.9027%	3.6182%	7.8434%	7.6830%
32	0.0395%	0.0230%	2.1127%	0.6973%	84	5.4774%	4.0111%	8.2860%	8.2118%
33	0.0443%	0.0267%	2.1127%	0.6973%	85	6.1056%	4.4537%	8.7401%	8.7802%
34	0.0499%	0.0305%	2.1127%	0.6973%	86	6.7903%	4.9533%	9.2038%	9.3899%
35	0.0561%	0.0343%	2.1127%	0.6973%	87	7.5374%	5.5183%	9.6757%	10.0423%
36	0.0623%	0.0378%	2.1127%	0.6973%	88	8.3567%	6.1545%	10.1548%	10.9799%
37	0.0687%	0.0414%	2.1127%	0.6973%	89	9.4672%	6.8642%	10.6403%	12.0002%
38	0.0747%	0.0447%	2.1127%	0.6973%	90	10.7159%	7.6456%	11.3837%	13.1079%
39	0.0803%	0.0482%	2.1127%	0.6973%	91	12.1091%	8.4900%	12.1616%	14.2827%
40	0.0856%	0.0520%	2.1127%	0.6973%	92	13.6455%	9.5938%	12.9759%	15.6624%
41	0.0907%	0.0564%	2.1127%	0.6973%	93	15.1969%	10.7721%	14.3793%	17.0388%
42	0.0958%	0.0614%	2.1127%	0.6973%	94	16.8478%	12.0053%	16.0141%	18.3935%
43	0.1014%	0.0673%	2.1127%	0.6973%	95	18.5823%	13.2726%	17.7537%	19.7074%
44	0.1079%	0.0742%	2.1127%	0.7661%	96	20.3835%	14.5548%	19.5815%	20.5046%
45	0.1154%	0.0815%	2.1127%	0.8386%	97	22.2363%	15.8338%	21.4796%	21.6587%
46	0.1241%	0.0895%	2.1127%	0.9150%	98	24.1287%	17.0927%	23.4320%	22.2278%
47	0.1340%	0.0978%	2.1127%	0.9954%	99	26.0534%	18.3137%	25.4262%	23.4285%
48	0.1436%	0.1064%	2.1127%	1.0797%	100	27.3954%	19.0545%	27.4544%	24.3532%
49	0.1540%	0.1153%	2.2322%	1.1679%	101	29.3314%	20.1270%	28.8685%	26.0252%
50	0.1652%	0.1247%	2.3517%	1.2595%	102	30.6060%	20.6559%	30.9086%	27.2980%
51	0.1772%	0.1348%	2.4715%	1.3540%	103	32.5663%	21.7717%	32.2518%	29.3116%
52	0.1899%	0.1458%	2.5916%	1.4189%	104	33.7521%	22.6310%	34.3175%	30.7811%
53	0.2175%	0.1611%	2.7122%	1.4817%	105	35.5581%	24.1847%	35.5670%	32.2725%
54	0.2369%	0.1755%	2.8332%	1.5416%	106	36.3901%	25.3675%	37.4701%	33.7441%
55	0.2590%	0.1920%	2.9544%	1.5983%	107	37.7582%	27.2387%	38.3469%	35.1544%
56	0.2839%	0.2062%	3.0757%	1.6517%	108	37.9589%	28.6043%	39.7886%	36.4617%
57	0.3219%	0.2261%	3.1968%	1.7022%	109	37.9589%	29.9902%	40.0000%	37.6246%
58	0.3730%	0.2516%	3.3175%	1.7507%	110	37.9589%	31.3578%	40.0000%	38.6015%
59	0.4078%	0.2769%	3.4383%	1.7982%	111	37.9589%	32.6683%	40.0000%	39.3507%
60	0.4481%	0.3055%	3.4817%	1.8463%	112	37.9589%	33.8832%	40.0000%	39.8308%
61	0.4942%	0.3383%	3.5227%	1.9393%	113	37.9589%	34.9638%	40.0000%	40.0000%
62	0.5486%	0.3765%	3.5625%	2.0396%	114	37.9589%	35.8716%	40.0000%	40.0000%
63	0.6105%	0.4236%	3.6022%	2.1489%	115	37.9589%	36.5679%	40.0000%	40.0000%
64	0.6812%	0.4743%	3.6432%	2.2691%	116	37.9589%	37.0140%	40.0000%	40.0000%
65	0.7616%	0.5449%	3.6868%	2.4018%	117	37.9589%	37.1712%	40.0000%	40.0000%
66	0.8393%	0.6142%	3.7343%	2.5482%	118	37.9589%	37.1712%	40.0000%	100.0000%
67	0.9268%	0.6916%	3.7873%	2.7093%	119	37.9589%	37.1712%	40.0000%	100.0000%
68	1.0254%	0.7805%	3.8471%	2.8857%	120	100.0000%	100.0000%	100.0000%	100.0000%

Recommended Rates of Retirement

Number of Service Retirements Eligible for a Reduced Benefit				
	Current Vs. Proposed Rates			
	Non-University Members		University Members	
Age	Current	Proposed	Current	Proposed
50	0.0500	0.0600	0.0700	0.0700
51	0.0500	0.0600	0.0700	0.0700
52	0.0500	0.0600	0.0700	0.0700
53	0.0500	0.0600	0.0700	0.0700
54	0.0500	0.0700	0.0700	0.0700
55	0.0700	0.0700	0.0700	0.0700
56	0.0700	0.0700	0.0700	0.0700
57	0.0700	0.0700	0.0700	0.0700
58	0.0700	0.0700	0.0700	0.0700
59	0.0700	0.0700	0.0700	0.0700

Recommended Rates of Retirement, cont.

Number of Service Retirements First Eligible for an Unreduced Benefit				
	Current Vs. Proposed Rates			
	Non-University Members		University Members	
Age	Current	Proposed	Current	Proposed
45	0.0800	0.1600	0.1700	0.1700
46	0.0800	0.1600	0.1700	0.1700
47	0.0800	0.1600	0.1700	0.1700
48	0.0800	0.1600	0.1700	0.1700
49	0.0800	0.1600	0.1700	0.1700
50	0.0800	0.0900	0.1700	0.1700
51	0.0800	0.0600	0.1700	0.1700
52	0.0800	0.0600	0.1700	0.1700
53	0.0900	0.0600	0.1700	0.1700
54	0.0900	0.0600	0.1700	0.1700
55	0.0900	0.0600	0.1500	0.1500
56	0.1200	0.0900	0.1500	0.1500
57	0.1180	0.1350	0.1500	0.1500
58	0.1480	0.1850	0.1500	0.1500
59	0.1740	0.1850	0.1500	0.1500
60	0.1460	0.1350	0.1500	0.1500
61	0.2130	0.2100	0.1400	0.1400
62	0.2380	0.2100	0.2000	0.2000
63	0.1140	0.2100	0.1400	0.1400
64	0.1900	0.3000	0.2000	0.2000
65	0.4000	0.3000	0.2800	0.2800
66	0.0800	0.3000	0.2100	0.2100
67	0.3000	0.3000	0.2100	0.2100
68	0.0600	0.3000	0.2100	0.2100
69	0.0600	0.3000	0.2100	0.2100

Recommended Rates of Retirement, cont.

Number of Service Retirements Beyond First Eligibility for an Unreduced Benefit				
	Current Vs. Proposed Rates			
	Non-University Members		University Members	
Age	Current	Proposed	Current	Proposed
45	0.0550	0.0800	0.0800	0.0800
46	0.0550	0.0800	0.0800	0.0800
47	0.0550	0.0800	0.0800	0.0800
48	0.0550	0.0800	0.0800	0.0800
49	0.0550	0.0600	0.0800	0.0800
50	0.0550	0.0550	0.0800	0.0800
51	0.0630	0.0630	0.0800	0.0800
52	0.0800	0.0800	0.0800	0.0800
53	0.0730	0.0730	0.0800	0.0800
54	0.0820	0.0820	0.0800	0.0800
55	0.0980	0.0980	0.0800	0.0800
56	0.1130	0.1130	0.0800	0.0800
57	0.1250	0.1250	0.0800	0.0800
58	0.1310	0.1310	0.0800	0.0800
59	0.1480	0.1480	0.0800	0.0800
60	0.1700	0.2000	0.0850	0.0850
61	0.2500	0.2400	0.1450	0.1500
62	0.2500	0.2300	0.1900	0.1500
63	0.2500	0.2300	0.1450	0.1500
64	0.2500	0.2750	0.1800	0.1950
65	0.3500	0.3900	0.2600	0.2600
66	0.2000	0.2500	0.2100	0.1950
67	0.2000	0.2500	0.2450	0.2150
68	0.2000	0.2500	0.1950	0.1950
69	0.2000	0.2500	0.3000	0.1950

Recommended Rates of Withdrawal

Years of Service	Full Time Withdrawal Rates	
	Current	Proposed
Less than 1	0.3650	0.3168
1	0.2050	0.1739
2	0.1460	0.1141
3	0.1050	0.1050
4	0.0850	0.0800
5	0.0700	0.0670
6	0.0640	0.0550
7	0.0580	0.0412
8	0.0540	0.0365
9	0.0500	0.0327
10	0.0430	0.0296
11	0.0390	0.0271
12	0.0350	0.0249
13	0.0320	0.0231
14	0.0290	0.0215
15	0.0260	0.0201
16	0.0230	0.0189
17	0.0200	0.0178
18	0.0190	0.0168
19	0.0180	0.0159
20	0.0170	0.0151
21	0.0160	0.0144
22	0.0150	0.0138
23	0.0150	0.0132
24	0.0150	0.0126

Recommended Rates of Withdrawal, cont.

Years of Service	Part Time Withdrawal Rates	
	Current	Proposed
Less than 1	0.3650	0.3600
1	0.2050	0.2673
2	0.1460	0.2397
3	0.1050	0.2201
4	0.0850	0.2050
5	0.0700	0.1926
6	0.0640	0.1821
7	0.0580	0.1690
8	0.0540	0.1513
9	0.0500	0.1422
10	0.0430	0.1350
11	0.0390	0.1250
12	0.0350	0.1200
13	0.0320	0.1100
14	0.0290	0.1014
15	0.0260	0.1013
16	0.0230	0.0986
17	0.0200	0.0912
18	0.0190	0.0900
19	0.0180	0.0900
20	0.0170	0.0900
21	0.0160	0.0900
22	0.0150	0.0900
23	0.0150	0.0900
24	0.0150	0.0900

Recommended Rates of Salary Increase

Years of Service	Genarl Members			University Members		
	Individual Merit & Longevity	General Wage Increase	Total Salary Increase	Individual Merit & Longevity	General Wage Increase	Total Salary Increase
1	4.51%	3.25%	7.76%	1.00%	3.25%	4.25%
2	4.09%	3.25%	7.34%	1.00%	3.25%	4.25%
3	3.46%	3.25%	6.71%	1.00%	3.25%	4.25%
4	2.94%	3.25%	6.19%	1.00%	3.25%	4.25%
5	2.52%	3.25%	5.77%	1.00%	3.25%	4.25%
6	2.21%	3.25%	5.46%	1.00%	3.25%	4.25%
7	1.89%	3.25%	5.14%	1.00%	3.25%	4.25%
8	1.68%	3.25%	4.93%	1.00%	3.25%	4.25%
9	1.47%	3.25%	4.72%	1.00%	3.25%	4.25%
10	1.31%	3.25%	4.56%	1.00%	3.25%	4.25%
11	1.16%	3.25%	4.41%	1.00%	3.25%	4.25%
12	1.00%	3.25%	4.25%	1.00%	3.25%	4.25%
13	0.84%	3.25%	4.09%	1.00%	3.25%	4.25%
14	0.68%	3.25%	3.93%	1.00%	3.25%	4.25%
15	0.58%	3.25%	3.83%	1.00%	3.25%	4.25%
16	0.47%	3.25%	3.72%	1.00%	3.25%	4.25%
17	0.37%	3.25%	3.62%	1.00%	3.25%	4.25%
18	0.26%	3.25%	3.51%	1.00%	3.25%	4.25%
19	0.21%	3.25%	3.46%	1.00%	3.25%	4.25%
20	0.16%	3.25%	3.41%	1.00%	3.25%	4.25%
21	0.11%	3.25%	3.36%	1.00%	3.25%	4.25%
22 & Up	0.00%	3.25%	3.25%	1.00%	3.25%	4.25%